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This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. This issue contains abstracts 45372 - 46274.

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U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, N. C. 27711

AIR POLLUTION ABSTRACTS

VOLUME 6, NO. 4 APRIL 1975

Prepared by
Air Pollution Technical Information Center (APTIC)
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Personal authors are arranged alphabetically. The names are presented last name first. When the author is a primary author, an asterisk precedes the Abstract Number.

INTRODUCTION

This periodical is intended to inform personnel of the Environmental Protection Agency (EPA), and others who are also professionally interested in air pollution, of selected technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Semiannual cumulative indexes to both subject and author are also sent to all recipients of this monthly publication.

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As another service, abstracts of all of the literature in APTIC (not just in a single issue of this periodical) on any subject related to air pollution will be provided free of charge upon request. APTIC can search information more recent than that in the current issue of this periodical because of the lapse of time entailed by editorial, make-up, and printing work. More than 1400 subject index terms are available for such searching ---more than those included in the subject index in each issue.

Acknowledgement is given to the Technical Publications Branch, Informational Services Division, Office of Administration, Research Triangle Park, N.C. for the make-up of the cover and for arrangement of printing and distribution.

Feedback from our users, including suggestions of articles, are always welcome.

APTIC Publications

Air Pollution Aspects of Emission Sources: Primary Lead Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:126, $0.65.

Air pollution Aspects of Emission Sources: Primary Copper Production - A Bibliography with Abstracts, June 1973 GPO No. EP 4.9:125, $0.70.

Air Pollution Aspects of Emission Sources: Pulp and Paper Industry - A Bibliography with Abstracts, March 1973, GPO No. EP 4.9:121, $2.35.

Air Pollution Aspects of Emission Sources: Primary Aluminum Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:119, $0.90.

Mercury and Air Pollution: A Bibliography with Abstracts, October 1972, GPO No. EP 4.9:114, $1.25.

Odors and Air Pollution: A Bibliography with Abstracts, October 1972, GPO No. EP 4.9:113, $3.00.

Air Pollution Aspects of Emission Sources: Petroleum Refineries - A Bibliography With Abstracts, July 1972, GPO No. EP 4.9:110, $1.25.

Air Pollution Aspects of Emission Sources: Iron and Steel Mills - A Bibliography With Abstracts, May 1972, GPO No. EP 4.9:107, $1.00.

Air Pollution Aspects of Emission Sources: Boilers - A Bibliography With Abstracts, May 1972, GPO No. EP 4.9:105, $2.00.

Hydrochloric Acid and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:100, $0.55.

Chlorine and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:99, $0.55.

Air Pollution Aspects of Emission Sources: Electric Power Production - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:96, $2.25.

Air Pollution Aspects of Emission Sources: Cement Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:95, $0.50.

Air Pollution Aspects of Emission Sources: Sulfuric Acid Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:94, $0.65.

Air Pollution Aspects of Emission Sources: Nitric Acid Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:93, $0.45.

Air Pollution Aspects of Emission Sources: Municipal Incineration - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:92, $1.00.

Photochemical Oxidants and Air Pollution: An Annotated Bibliography (2 Volumes), March 1971, GPO No. EP 4.9:88, $6.25.

Beryllium and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:83, $0.40.

Asbestos and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:82, $0.50.

Municipal Incineration: A Review of Literature, June 1971, GPO No. EP 4.9:79, $1.00.

Hydrocarbons and Air Pollution: An Annotated Bibliography (2 Volumes), October 1970, GPO No. HE 20.1309:75, $5.00.

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RECENT CONTRACT AWARDS

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Durham Contract Operations
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Contract No. 68-02-1376, Task Order No. 19 .... *$40,000*
MODEL VALIDATION STUDIES AND EVALUATION OF TIME CONCENTRATION RELATIONSHIPS.
GCA Technology Division, A Division of GCA Corporation, Burlington Road, Bedford, Massachusetts 01730

Contract No. 68-02-1876, RFP No. Du-75-A017 .... *$150,000*
FABRICATION, INSTALLATION AND CHECKOUT OF AN AEROSOL GENERATION SYSTEM.
Acurex Corporation, Aerotherm Division, 485 Clyde Avenue, Mountain View, California 94042

Contract No. 68-02-1567, Modification No. 6 .... *$124,620*
THE ENVIRONMENTAL PROTECTION AGENCY CONTEMPLATES ADDITIONAL EFFORT WITH NORTHROP SERVICES, INC., HUNTSVILLE, ALABAMA FOR TECHNICAL SUPPORT SERVICES FOR THE EPA EMISSION TEST FACILITY AT RESEARCH TRIANGLE PARK, NORTH CAROLINA 27711.
Northrop Services, Inc., P. O. Box 1484, Huntsville, Alabama 35807 (NOTE: Contract contains options in the amount of $141,160)

Contract No. 68-02-1873, RFP No. Du-75-A088 .... *$343,765*
INVESTIGATION OF AERODYNAMIC PHENOMENA IN THE CONTROL OF POLLUTANTS FROM GASEOUS AND HETEROGENEOUS COMBUSTION.
United Aircraft Research Laboratories, United Aircraft Corporation, 400 Main Street, East Hartford, Connecticut 06108

Contract No. 68-02-1875, RFP No. Du-75-A115 .... *$136,161*
RAPPING REENTRAINMENT LOSSES FROM ELECTROSTATIC PRECIPITATORS.
Southern Research Institute, 2000 Ninth Avenue, South, Birmingham, Alabama 35205

Contract No. 68-02-0584, Modification No. 13 .... *$27,000*
DEVELOPMENT, FABRICATION AND INSTALLATION OF A MOISTURE MONITOR AND AN IN-SITU PARTICULATE MASS MONITOR FOR THE STATIONARY SOURCE SIMULATOR.
Aerotherm Division, Acurex Corporation, 485 Clyde Avenue, Mountain View, California 94042

Contract No. 68-02-1377, Task Order No. 6 .... *$55,000*
TECHNICAL SUPPORT TO THE STATES OF RHODE ISLAND AND CONNECTICUT TO DEVELOP AIR QUALITY MAINTAINANCE PLANS.
Walden Research, A Division of Abcor, Inc., 201 Vassar Street, Cambridge, Massachusetts 02139

Contract No. 68-02-0298, RFP No. Du-75-A098 .... *$24,450*
PROFESSIONAL SERVICES IN ASSESSING NEW EMISSIONS CONTROL TECHNOLOGIES.
Paul W. Spaite, 6315 Grand Vista Avenue, Cincinnati, Ohio 45213 (NOTE: Contract contains options in the amount of $23,000)

Contract No. 68-02-1872, RFP No. Du-74-X102 .... *$148,063*
FIELD TESTING OF CONTROL CONCEPTS FOR ABATEMENT OF EMISSIONS FROM ASBESTOS CEMENT MANUFACTURING WASTES.
IIT Research Institute, 10 West 35th Street, Chicago, Illinois 60616

Contract No. 68-02-1774, RFP No. Du-75-B065 .... *$31,394*
DEVELOPMENT OF SO2-SO3 MEASUREMENT CAPABILITY AND IMPROVEMENTS FOR EXISTING GAS FILTER CORRELATION INSTRUMENT.
Philco-Ford Corporation, Aeronutronic Division, Ford Road, Newport Beach, California 92663

Contract No. 68-02-1781, RFP No. Du-75-B108 .... *$47,000*
ON-SITE TECHNICAL SERVICES, CALIBRATION AND MAINTENANCE OF GOVERNMENT-OWNED BENDIX MODEL 8101B, NO/NOz/NOx ANALYZERS.
The Bendix Corporation, Process Instruments Division, Route 219 North, Lewisburg, West Virginia 24901

Contract No. 68-02-1871, RFP No. Du-75-A080 .... *$498,790*
TEST AND EVALUATION OF A REFUSE FIRING DEMONSTRATION IN ST. LOUIS.
Midwest Research Institute, 425 Volker Boulevard, Kansas City, Missouri 64110

Contract No. 68-02-1377, Task Order No. 5 .... *$30,000*
TECHNICAL SUPPORT TO THE STATE OF MASSACHUSETTS IN DEVELOPMENT OF AN AIR QUALITY MAINTENANCE PLAN.
Walden Research, Division of Abcor, Inc., 201 Vassar Street, Cambridge, Massachusetts 02139

Contract No. 68-02-1383, Task Order No. 11 .... *$50,000*
AIR POLLUTION CONTROL ANALYSIS REPORT ON NINE MAJOR INDUSTRIES: PORTLAND CEMENT, ASPHALT CONCRETE, GREY IRON, FERRO ALLOY, COAL CLEANING, PRIMARY ALUMINUM, PHOSPHATE FERTILIZER, SULFURIC ACID, NITRIC ACID, PHASE II.
Radian Corporation, 8500 Shoal Creek Boulevard, Austin, Texas 78766

Contract No. 68-02-1787, RFP No. Du-75-B140 .... *$34,000*
THE EFFECT OF NONIONIZING ELECTROMAGNETIC RADIATION ON CHROMOSOMES AND DNA.
Duke University Medical Center, Durham, North Carolina 27710

SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry--e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. EFFECTS--HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS--PLANTS AND LIVESTOCK

Effects on vegetation--crops, trees, other plants--and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS--MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

ABSTRACT BULLETIN

EMISSION SOURCES

1974

45372 **APTIC NO. [illegible]**

Anderson, M. Norman and Bobby G. Wixson

IS LEAD REALLY A FOUR LETTER WORD? PROBLEMS, PARTICIPATION AND TRUST RESULTS IN PROGRESS. *Missouri Univ., Columbia, Trace Subst. Environ. Health, Proc. Univ. Mo. Annu. Conf., 7th, Columbia, Mo., 1974, p. 191-203. 7 refs.*

Missouri produces 80% of the U. S. lead, which had a value of $185 million in 1972. An environmental problem, discoloration of trees near a Missouri lead smelter in the summer of 1970, led to the initiation of a research program on lead and trace metals at the sources of mining, milling, transportation, smelting, and refining in the state to evaluate possible effects on the surrounding environment. Effective monitoring networks were established, and the environmental impact of trace metals was evaluated by the use of baseline data and control areas to delineate problem areas. Practical applications of this cooperative research to date have included improved mine-mill effluent treatment through the use of meanders and polishing lagoons. In the lead smelter area, tall stack studies have been initiated, an automated sulfur dioxide monitoring system has been installed, and plant operators have been trained to become more aware of malfunctions. The acid plant has been modified, and new dust control systems are being installed. Planning is also underway to achieve a zero effluent discharge and to control wind blown dust. (Author abstract modified)

45373 **APTIC NO. 68703**

Balogh, Erno

AIR POLLUTION IN TATABANYA AND METHOD OF AIR POLLUTION STUDY FOR INDUSTRIAL AREAS. *(Tatabanya levegoszennyezodese es az iparvidekek levegoszennyezettsegenek vizsgalati modszere). Text in Hungarian. Tatabanyai Szenbanyak Muszaki-Kozgazdasagi Kozl., no. 2-3:69-73, April-Sept. 1974. 15 refs.*

An inventory is presented of the air pollutant emissions in the Tatabanya region, Hungary, and a general method for the study of air pollution in industrial areas is outlined. Fly ash, dust, sulfur dioxide, and fluorides are the chief pollutants emitted in this industrial area that consumes 1,160,000 tons of coal yearly. A thermal power plant, equipped with electrostatic precipitators for fly ash separation, emits fly ash and SO2, a gaseous pollutant for whose removal there is currently no economically acceptable method available. It will be possible to abate the dust emission from a large-capacity cement works by the use of electrostatic precipitators. It was possible to reduce the SO2 concentration peak from 5 mg/cu m to 0.3 mg/cu m by increasing the stack height from 50 m to 160 m at a power plant. This change also resulted in a shift of the site of the peak concentration to a greater distance from the emission source. The automotive exhaust-generated air pollution, though increasing, is well below the allowable level. The expansion of residential areas with long-distance heating systems is a valuable contribution to air pollution abatement. The expectable ground-level concentrations can be estimated from the pollutant discharge on the basis of wind speed and wind direction distribution.

45374 **APTIC NO. 68853**

Bolton, N. E., W. Fulkerson, R. I. Van Hook, W. S. Lyon, A. W. Andren, J. A. Carter, M. T. Mills, J. F. Emery, C. Feldman, L. D. Hulett, H. W. Dunn, C. J. Sparks, Jr., and J. C. Ogle

TRACE ELEMENT MEASUREMENTS AT THE COAL-FIRED ALLEN STEAM PLANT – PROGRESS REPORT. FEBRUARY 1973 – JULY 1973. *Atomic Energy Commission/National Science Foundation Interagency Agreement AG-450, 47p., June 1974. 12 refs.*

NTIS: ORNL-NSF-EP-62; GPO

The disposition of trace elements from coal combustion was studied at the Tennessee Valley Authority Thomas A. Allen Steam Plant in Memphis, Tennessee. The plant has a peak capacity of 870 MW generated from three similar cyclone-fed boilers. The study consisted of in-plant sampling to obtain a mass balance and emission characteristics for an extensive group of elements and sampling in the environment to ascertain the fate of discharges of these elements. A reasonably good mass balance (+7 to -25%) was obtained for cadmium, lead, and zinc in coal, fly ash, and slag. Except for Cd, most of the elements entering the plant with coal were emitted with fly ash. About 70% of the mercury in coal was trapped using iodine monochloride filled impingers to trap volatile Hg. X-ray fluorescence analysis of individual particles using the scanning electron microscope indicated that the composition is very complex and that the particles are composed of many elements. Ion etching revealed a few hollow particles and an enrichment of sulfur, nickel, and chromium in the outer crust of the larger particles. Atmospheric Gaussian plume dispersion modeling of the emissions was used to calculate ambient air concentrations of Hg near the plant. Even under the most adverse meteorological conditions, the maximum ambient air level of approximately 50 ng/cu m was still more than an order of magnitude less than the ambient air standard of 1000 ng/cu m. The dry and wet deposition of fly ash was also calculated using the model so that soil enrichment for various trace elements could be estimated. The enrichment is negligible except perhaps very close to the plant. Complete tabulations for trace element measurements in Memphis area soil and moss specimens are given. The trace elemental concentrations of mosses were uniformly lower than for the soil. (Author conclusions modified)

45375 **APTIC NO. 68934**

Broering, L. C. and L. W. Holtman

EFFECT OF DIESEL FUEL PROPERTIES ON EMISSIONS AND PERFORMANCE. *Preprint, Society of Automotive Engineers, Inc., New York, 13p., 1974. 12 refs. (Presented at the Society of Automotive Engineers, National Combined Farm, Construction and Industrial Machinery and Powerplant Meetings, Milwaukee, Wis., Sept. 9-12, 1974, Paper 740692.)*

Tests were conducted with several production diesel engines and one prototype low-emission diesel engine to determine the effect of fuel properties on exhaust emissions and engine performance. Fuel cetane number was the most significant fuel property; low cetane fuels resulted in higher hydrocarbons and oxides of nitrogen and increased noise. Conversely, higher cetane fuels produced lower emissions and noise, and also improved engine starting characteristics. The degree of these effects was influenced by engine configuration. Although engine

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design changes can result in substantial emissions reduction, fuel properties can also influence achieveable levels. (Author abstract)

45376 APTIC NO. 68526

Buchnea, Dmytro and Alexander Buchnea

AIR POLLUTION BY ALUMINUM COMPOUNDS RESULTING FROM CORROSION OF AIR CONDITIONERS. *Environ. Sci. Technol., 8(8):752-755, Aug. 1974. 11 refs.*

Air pollution caused by hydrated aluminum oxide, chlorinated aluminum oxide, and carbonated aluminum oxide resulting from the corrosion of air conditioners was investigated. In cold rooms at temperatures of 3-6 C, the pollutant precipitates from the air, coating all surfaces in the rooms with a film of gray dust. In air conditioned rooms at normal temperatures of 20-25 C, the Al based film was not evident, but the air contained approximately 10 times as much of the pollutant as that in the cold rooms. During summer days, when the air conditioner was at peak operation, there was a dust concentration of 364 micrograms/cu m in an air conditioned office. This dust contained approximately 124 micrograms of Al based compounds in a 1 cu m. A concentration of dust 365 micrograms/cu m of air corresponds to a dust concentration level unacceptable by Ontario Air Pollution Standards. A person inhales air at an average rate of .000116/cu m/sec; during a 19-hour period in an air conditioned environment, 4.2 cu m of air are inhaled in which there are 513 micrograms of Al based compounds. Particles less than 1 micron in diameter reach the alveoli of the lung. Maximum retention occurs at diameters between 1.0 and 0.5 micron, but below 0.2 micron. (Author abstract modified)

45377 APTIC NO. 64719

Bung, Willi

RESULTS OF MEASUREMENTS OF THE DROPLET EMISSION BY A 130 M HIGH NATURAL DRAFT COOLING TOWER. *(Ergebnisse der Tropfenauswurfmessung an einem 130 m hohen Naturzugkuehlturm). Text in German. Tue (Tech. Ueberwach)., 15(3):83-87, March 1974. 4 refs.*

A throttle calorimeter served for the measurement of the droplet emission on a 130 m high natural draft cooling tower which belonged to a 350 MW power plant. The tower had a cooling capacity of 450 Gcal/hr. The water throughput was 35,000 cu m/hr. The measurement arrangement on top of the cooling tower is illustrated. The total droplet emission, which was measured with the throttle calorimeter, consists of droplets carried along from the water distribution and the spraying installations and of droplets developing through post-condensation. The fraction of droplets stemming from post condensation can be determined from the circulating cooling water and the droplets collected. For this vessels were set up on top of the cooling tower in the first measurement series collecting the falling droplets. At the same time the water droplets were collected above the water distributor and on the ground 40 m from the cooling tower. In the second measurement series on top of the cooling tower as well as above the water distributor, waste air was drawn off with a cyclone and the droplets contained in it were collected. Of these samples and of the samples of the circulating water, the sodium and potassium concentration and the electric conductivity were determined. The results showed that 90% of the determined droplet concentration came from post condensation. The droplet concentration depended largely on the meteorological conditions. Through installation of a droplet trap, the droplet emission on the ground becomes, at most weather conditions, negligibly small.

45378 APTIC NO. 68780

Corbat, Jean-Pierre

AIR POLLUTION BY COMBUSTION MOTORS. *(Pollution de l air par les moteurs a combustion). Text in French. Bull. Tech. Suisse Romande (Lausanne), 100(1):2-20, Jan. 1974. 46 refs.*

The complex problem of automotive exhaust-generated air pollution is surveyed. Carbon monoxide is generated mostly by spark- ignition engines operating under nearly stoichiometric conditions, while diesel engine exhaust contains but a small amount of CO. Hydrocarbon emissions are due to flame quenching at the combustion chamber walls and to defects in the propagation of the reaction as a result of inhomogeneous mixture. The nitrogen oxides emission is highest under stoichiometric conditions at high combustion temperature. Smoking, a characteristic feature of diesel engines, is due to unburned hydrocarbon, soot, and lubricant emissions. Sulfur dioxide and lead emissions are generated by diesel and spark-ignition engines, respectively. Non-dispersive infrared analyzers, flame-ionization detectors, chemiluminescence analyzers, and photoelectric apparatuses are used for the analysis of CO, hydrocarbons, nitrogen oxides, and smoke, respectively. Good mixture formation, adequate selection of the injection and ignition timing, of the compression ratio, air-excess coefficient of the surface-to-volume ratio of the combustion chamber, and exhaust gas recirculation are the most effective measures against formation of harmful emissions. Thermal afterburning and catalytic oxidation and reduction are effective in exhaust emission control. Traffic-generated air pollution, especially in urban areas, can be abated by encouraging public transportation. Unconventional engine designs and energy sources are surveyed.

45379 APTIC NO. 68850

Crump, Lulie H. and Charles L. Readling

FUEL AND ENERGY DATA. UNITED STATES BY STATES AND REGIONS, 1972. *Bureau of Mines Information Circ., no. 8647:1-82, 1974. 16 refs.*

GPO

Salient information on reserves, production, and consumption of fuels and energy by state are summarized. The data are broken down by fossil fuels (coal, petroleum, and natural gas) and hydropower and nuclear power for the following major consuming sectors: household-commercial, industrial, transportation, electric power, and miscellaneous. In addition, total energy consumption in the nation in 1972 is compared with consumption in 1971 and 1973 based on preliminary data. (Author abstract)

45380 APTIC NO. 68930

Darling, Eugene M., Jr., David S. Prerau, and Paul J. Downey

COMPUTER ANALYSIS OF AIR POLLUTION FROM HIGHWAYS, STREETS, AND COMPLEX INTERCHANGES. A CASE STUDY. PORTIONS OF THE PROPOSED 3-A SYSTEM IN 1978, BALTIMORE, MARYLAND (FINAL REPORT). *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Work Unit OS422/R4524, DOT-TSC-OST-73-37, 156p., March 1974.*

NTIS: PB-231 334

A detailed computer analysis of air quality for a complex highway interchange was prepared using an in-house version of the Environmental Protection Agency s Gaussian Highway Line Source Model. The levels of air pollution near the proposed 3-A System interchange in Baltimore, Md., will not exceed established standards in 1978. The analysis illustrates a methodology useful for computing air pollution levels associated with many highway configurations. The technique consists of the handling of road geometry, the calculation of emissions, the estimation of meteorological parameters, and the selection of receptor locations. A complete listing of the computer program used in these studies is included. Within the limitations of the model and the traffic estimates used, the method can produce reasonable estimates of worst-case pollutant concentrations for comparison with the EPA national ambient air quality standards or other 1-hour and 8-hour standards. (Author abstract modified)

45381 **APTIC NO. 68306**

Diehl, Larry A. and James A. Biaglow

MEASUREMENT OF GASEOUS EMISSIONS FROM A TURBOFAN ENGINE AT SIMULATED ALTITUDE CONDITIONS. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, Work Unit 501-24, Rept. NASA TM X-3046, E-7821, 20p., April 1974. 12 refs.*

NTIS: N-74-22566

Gaseous emissions from a twin-spool turbofan aircraft engine were measured over a range of fuel-air ratios from idle to full power at simulated altitudes from near sea level to 13,200 m and at flight Mach numbers of 0.6 and 0.8. Carbon monoxide and unburned hydrocarbon emissions were highest at idle and decreased with increasing throttle. At the highest altitude tested, reduced combustor inlet temperature and pressure resulted in increased carbon monoxide and hydrocarbon emissions. Nitrogen oxide emissions were lowest at idle and increased with increasing throttle. Increasing altitude resulted in decreased NOx. Nitrogen oxides at idle consisted of 50-60% nitric oxide which increased to 90-95% at high power levels. A correlating parameter consisting of combustor variables was successful in correlating the NOx emissions to within an emission index value of plus or minus 0.5 for the range of test conditions investigated. (Author summary modified)

45382 **APTIC NO. 68948**

Domres, H. G.

DUST EMISSION FROM THREE 22-TON-CORELESS INDUCTION FURNACES AT THE MELTING OF CAST IRON WITH SCRAP IRON PREHEATING. *(Staubemission von drei 22-t-Induktionstiegeloefen beim Gusseisenschmelzbetrieb mit Schrottvorwaermung). Text in German. Giesserei Praxis, 1974(18):367-369, Sept. 1974. 5 refs.*

In a foundry with three coreless induction furnaces the particulate emission was measured at the 22-ton furnaces with continuous scrap preheating and at the ventilator in the workshop roof. For the quasi-continuous measurement of the dust concentration a radiometric unit was used. The highest dust emission occurred at the furnaces during charging of preheated scrap where the concentration measured 260 g/ton iron. The total emission from the foundry was about 500 g/ton. It was below the maximum allowable dust emission concentration recommended in VDI (Verein Deutsche Ingenieure) guideline 2288.

45383 **APTIC NO. 69117**

Gay, Bruce W., Jr., William A. Lonneman, Kenneth Bridbord, and John Moran

MEASUREMENTS OF VINYL CHLORIDE FROM AEROSOL SPRAYS. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Chemistry and Physics Lab., Human Studies Lab., and Fuels and Fuel Additive Program, 24p., 1974. 4 refs.*

Human exposure levels of vinyl chloride (VC) and its decay in home and office environments were determined. High concentrations of VC are measured when aerosol sprays containing VC are used. Samples collected 2 min after a 30 spray release in a 56,000 l room showed a VC concentration of 13.06 ppm and 13.70 ppm and a Freon-12 (F-12) concentration of 5.94 ppm and 6.05 ppm. Samples collected at the breathing zone during a 120 sec spray in a 133,000 l room showed VC concentrations of 41.64 and 41.9 ppm and F-12 concentrations of 44.83 and 43.67 ppm. Samples collected at the breathing zone during a 60 sec spray in a 29,300 l room showed VC concentrations of 122.7 and 124.4 ppm and F-12 concentrations of 62.15 and 58.30 ppm. Samples collected during a 30 sec spray and for 1 min longer in a 9000 l room showed VC concentrations of 59.2 and 61.1 ppm and F-12 concentrations of 28.16 and 28.15 ppm. Samples collected 1 min after a 30 sec spray in a 21,400 l room showed VC concentrations of 380.1 and 383.6 ppm and F-12 concentrations of 466.4 and 457.6 ppm. The decay in VC parallels the decay of F-12 which is also released from the aerosol spray.

45384 **APTIC NO. 68586**

Gerrard, Michael

CITIZEN S POLICY GUIDE TO ENVIRONMENTAL PRIORITIES FOR NEW YORK CITY, 1974-1984. PART I: ENERGY AND THE NEW YORK CITY ENVIRONMENT. *Council on the Environment of New York City, New York, Energy Task Force, 68p., Feb. 1974. 53 refs.*

Long-term energy priorities were developed for New York City that include environmental safeguards such as pollution control and clean fuel requirements. The national allocation of clean fuel cannot simply be an equitable distribution of the total quantity of fuel available. Major urban centers should have priority in obtaining cleaner fuels. Relaxed air quality standards should be avoided since many parts of the city still have toxic levels of air pollutants caused by burning fuels. Diversion of clean fuel, purchase of electricity from other areas, and voltage reduction should precede substantial use of dirty fuel. There are seeming conflicts between energy and environment arising from the use of catalytic converters on automobiles and from the use of leaded gasoline. Waste burning is an alternate fuel which can be used in New York. Burning garbage directly for electricity may involve the release of certain toxic substances in the air. Pyrolysis which converts the garbage into oil or gas has fewer pollution problems.

45385 **APTIC NO. 68745**

Gerrard, Michael

CITIZEN S POLICY GUIDE TO ENVIRONMENTAL PRIORITIES FOR NEW YORK CITY, 1974-1984. PART III: TRANSPORTATION POLICY AND THE NEW YORK ENVIRONMENT. *Council on the Environment of New York City, New York, Transportation Study Group, 66p., June 1974. 167 refs.*

Transportation priorities for the environment of New York City in the next decade were developed. They center on improvement in mass transit, increased use of transit, and far less reliance on the automobile. Air pollution is the single worst environmental effect of current transportation patterns in New York. Transportation accounts for 97% of the carbon monoxide emissions, 51% of the hydrocarbons, 28% of the nitrogen oxides, and 19% of the particulates in New York City air. Automobile air pollution can be reduced by changing the autos themselves with pollution control devices, using smaller cars, and upgrading inspection and maintenance. Altering patterns of auto use by encouraging carpools will also lower auto emissions. Buses are minor contributors of CO and hydrocarbons, but contribute significantly in the CBD and are the source of complaints about odor and visible emissions. Trucks in Manhattan account for about 20% of the vehicle air pollution. Possible remedies include consolidation of trucking activities, change in delivery hours, and off-street loading. Other modes of transportation discussed include railroads, boats and ships, airplanes, bicycles, and walking.

45386 **APTIC NO. 68775**

Gross, George P.

AUTOMOTIVE EMISSIONS OF POLYNUCLEAR AROMATIC HYDROCARBONS. *Preprint, Society of Automotive Engineers, Inc., New York, 22p., 1974. 22 refs. (Presented at the Society of Automotive Engineers National Combined Farm, Construction and Industrial Machinery and Fuels and Lubricants Meetings, Milwaukee, Wis., Sept. 10-13, 1973, Paper 740564.)*

Cyclic-test emissions of polynuclear aromatic hydrocarbons in passenger vehicle exhaust were studied in one vehicle without emission controls and in two vehicles with engine-modification emission controls. Special attention was given to the effects of engine deposits formed in light-duty cyclic operation and to the fuel composition factors governing PNA in deposits. Exhaust emissions of PNA were originated by three distinct mechanisms: synthesis from simpler molecules, storage in engine deposits and subsequent emission of PNA already in the fuel, and pyrolysis of lubricating oil. The most important factor was fuel PNA content. Current engine modification emission controls reduced PNA emissions by 65-70%, and two experimental advanced emission control systems reduced PNA by about 99%. The concentration PNA in deposit-formation fuels correlated linearly with the exhaust PNA concentration in tests which directly followed deposit accumulation. Increasing the heavy aromatics in a low PNA fuel by the addition of 20% heavy catalytic naphtha or 0.7% of a catalytic reformate fraction increased the emissions of several PNA species by 16-110%. Engine oil PNA produced no effect on PNA emissions at normal oil economy. (Author summary modified)

45387 **APTIC NO. 68253**

Haertel, G. R.

RELATIONS BETWEEN OBTAINABLE MIXTURE PREPARATION, EXHAUST GAS RE-CIRCULATION, EXHAUST EMISSIONS, AND FUEL CONSUMPTION OF OTTO CYCLE ENGINES. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 2.4.1-2.4.10. (Nov. 4-8, Paper A 2.4.)*

The effects of fuel characteristics and air/fuel ratio on the exhaust emission and fuel consumption of Otto cycle engines are discussed along with a test apparatus for bench measurements of carbon monoxide, carbon dioxide, unburned hydrocarbons as hexane, and nitric oxide. Tests are conducted with an intake manifold of a 4-cylinder inline engine, using only one branch for two cylinders. The fuel found on the wall at the manifold outlet (the degree of precipitation) is greatly reduced by increasing the air component of the air/fuel ratio. The lower the boiling point of the fuel used, the lower the precipitation at the manifold outlet. A family of curves is presented for the concentration of unburned hydrocarbons (as C6H14), NO, specific fuel consumption, and air flow at one operating condition. Conclusions can be drawn only after measuring a series of lean running limits in stationary operation.

45388 **APTIC NO. 68545**

Hare, C. T., K. J. Springer, and T. A. Huls

LOCOMOTIVE EXHAUST EMISSIONS AND THEIR IMPACT. *Preprint, American Society of Mechanical Engineers, New York, 19., 1974. 17 refs. (Presented at the American Society of Mechanical Engineers, Diesel and Gas Engine Power Conference and Exhibit, Houston, Tex., April 28-May 2, 1974, Paper 74-DGP-3.)*

Exhaust emission measurements were made on three locomotive diesel engines -- an EMD 12-567, an EMD 16-645E-3, and a General Electric 7FDL16. Constituents measured included total hydrocarbons, light hydrocarbons, carbon monoxide, carbon dioxide, nitric oxide by two methods, nitrogen oxides, oxygen, aldehydes, and smoke. The locomotives were operated in a stationary position at a diagnostic facility, and continuous analysis was employed for all constituents except light hydrocarbons and aldehydes. The emissions data acquired were used in conjunction with information on locomotive population and usage to estimate emission factors and national emissions impact. Locomotive emissions expressed as percentages of the 1970 national total emissions were 0.5% HC from all sources and 0.8% HC from mobile sources, 0.1% CO from all sources and 0.2% CO from mobile sources, 2.7% NOx from all sources and 5.2% NOx from mobile, and 0.3% sulfur oxides from all sources and 9.6% SOx from mobile sources. (Author abstract modified)

45389 **APTIC NO. 68587**

Hare, Charles T., Karl J. Springer, William R. Oliver, William H. Houtman, and Thomas A. Huls

MOTORCYCLE EMISSIONS, THEIR IMPACT, AND POSSIBLE CONTROL TECHNIQUES. *Preprint, Society of Automotive Engineers, Inc., New York, 39p., 1974. 49 refs. (Presented at the Society of Automotive Engineers West Coast Meeting, Anaheim, Calif., Aug. 12-16, 1974.)*

Seven motorcycles, ranging in size from 100-1200 cu cm were tested for emissions characterization purposes using the federal seven-mode test procedure for 1971 and older light-duty vehicles, the federal LA-4 test for 1972 and later light duty vehicles, and various steady-state conditions. Emission factors and national impact were also calculated. Expressing motorcycle emissions as percentages of revised 1970 national totals from all sources, motorcycles were estimated to account for about 0.6% of hydrocarbons, 0.5% of the carbon monoxide, 0.01% of the nitrogen oxides, 0.002% of the sulfur oxides, and 0.01% of the particulates. As percentages of revised 1970 national totals from mobile sources only, motorcycles were estimated to be responsible for 1.0% of the hydrocarbons, 0.9% of CO, 0.03% of NOx, 0.05% of SOx, and 0.3% of particulates. An examination of the tentative standards for the 1976 model year showed that the most significant reductions must occur in hydrocarbons from 2-stroke bikes and CO from larger machines (both 2-stroke and 4-stroke). (Author summary modified)

45390 **APTIC NO. 68809**

Hare, Charles T. and Karl J. Springer

EXHAUST EMISSIONS FROM UNCONTROLLED VEHICLES AND RELATED EQUIPMENT USING INTERNAL COMBUSTION ENGINES: PART 6 - GAS TURBINE ELECTRIC UTILITY POWER PLANTS. FINAL REPORT. *Southwest Research Inst., San Antonio, Tex., Vehicle Emissions Research Lab., Office of Air and Waste Management Contract EHS 70-108, Rept. APTD-1495, AR-940, 40p., Feb. 1974. 24 refs.*

NTIS: PB 235751/AS

Emissions data derived from laboratory and field test findings reported in the literature are summarized for gas turbine electric utility power plants. The data are utilized together with information on the location and population of the plants to estimate national emissions impact, based on usage as reported to the Federal Power Commission. Expressing emissions from electric utility turbines as percentages of 1970 national totals from all sources, they account for approximately 0.6% of the nitrogen oxides, 0.05% of the hydrocarbons, 0.04% of the carbon monoxide, 0.03% of the particulates, and 0.02% of the sulfur oxides. Although overall emissions from electric utility turbines are not a large percentage of total emissions, they do occur in urban and suburban areas where they have good potential to affect people. These emissions probably occur during afternoon pollution peak hours and during the summer when other air pollution problems may be severe. The potential growth of turbine usage for power generation is quite substantial, although the Federal Power Commission estimates that the fraction of total electric power generated by turbines will probably not increase substantially in the near term.

45391 **APTIC NO. 69141**

Hare, Charles T., Karl J. Springer, and Thomas A. Huls

EXHAUST EMISSIONS FROM 2-STROKE OUTBOARD MOTORS AND THEIR IMPACT. *Preprint, Society of Automotive Engineers, Inc., New York, 27p., 1974. 15 refs. (Presented at the Society of Automotive Engineers, National Combined Farm, Construction and Industrial Machinery and Powerplant Meetings, Milwaukee, Wis., Sept. 9-12, 1974, Paper 740737.)*

To characterize the exhaust emissions from water-cooled 2-stroke outboard motors, four new motors were tested on dynamometer stands. The engines ranged from 4-65 hp in size, and operating conditions were chosen along lines of simulated boat loading. All the measurements were taken at steady-state conditions. Emissions were measured in the raw exhaust gas and after the gases had been bubbled through water in a specially constructed tank. Constituents measured included hydrocarbons, carbon monoxide, carbon dioxide, nitric oxide, nitrogen oxides, oxygen, light hydrocarbons, and aldehydes. Emissions of sulfur oxides were estimated on the basis of fuel consumed. All the exhaust emissions data were used with available information on population and usage of motors to estimate exhaust emission factors and national exhaust emissions impact. The study did not address the fate of pollutants in either air or water as a function of residence time, nor did it include any assessment of environmental effects due to outboard emissions. As percentages of revised 1970 national air pollutants from all sources, outboard atmospheric emissions account for about 1% of HC, 0.9% of CO, 0.008% of NOx, and 0.004% of SOx. Expressed as percentages of revised 1970 totals for mobile sources only, outboards account for about 2% of HC, 1% of CO, 0.02% of NOx, and 0.1% of SOx. (Author abstract modified)

45392 APTIC NO. 68975

Hayakawa, Kazuya, Takeshi Kubo, and Nobuo Koseki

FUNDAMENTAL STUDIES OF AIR POLLUTION EFFECTS ON ENVIRONMENTAL CAPACITY. (3) EMISSION INTENSITIES OF AIR POLLUTANTS. *(Taiki osen no kankyo yoryo ni kansuru kisoteki kenkyu. (Sono 3) Taiki osen busshitsu no haishutsu kyodo). Text in Japanese. Preprint, Japan Society of Architecture, Tokyo, p. 173-174, 1974. 2 refs. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4087.)*

To investigate the efficacy of anti-air pollution measures, pollutant emissions in metropolitan Tokyo were examined with respect to administrative districts, pollution sources, and time periods. A grid (mesh size, 1 sq km) was superimposed on the region. Data was culled from reports submitted to various government agencies in 1971 and 1972. In metropolitan Tokyo, most sulfur oxides and airborne particulate matter came from stationary pollution sources, whereas carbon monoxide, hydrocarbons, and aldehydes were products of mobile sources (motor vehicles). Nitrogen oxides occupied an intermediate position.

45393 APTIC NO. 68292

Hiereth, H., E. Eisele, and H. Polz

INVESTIGATIONS INTO THE USE OF THE COMPREX SUPERCHARGER SYSTEM ON A HIGH-SPEED DIESEL CAR ENGINE. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 41.1-41.12. (Nov. 4-8, Paper 41.)*

Performance data, fuel consumption, and exhaust emissions were measured for a modified diesel car engine (2.2 l swept volume) equipped with a Comprex supercharger system designed to increase diesel engine power output. The supercharger system was based on the direct exchange of pulses between the exhaust gas, which was under increased pressure, and the fresh air by means of controlled pressure waves. Output and torque characteristics attained equalled those of a gasoline engine with about the same swept volume. Emission levels and fuel consumption were retained at approximately the same levels as those from a standard diesel engine. Thus the supercharger system increased diesel performance without sacrificing the engine s inherent anti- pollution advantages.

45394 APTIC NO. 68475

Hotzel, E.

THE USE OF BITUMINOUS COAL IN POWER PLANTS AND CLEAN AIR MAINTENANCE. *(Steinkohlenverwendung im Kraftwerk und Luftreinhaltung). Text in German. VGB Kraftwerkstechnik, 54(2):69-75, Feb. 1974. 9 refs.*

The problems and possibilities of clean air maintenance in bituminous coal-fired power plants are discussed with regard to recent environmental legislation in West Germany. The reduction of the maximum allowable dust and sulfur dioxide concentrations jeopardizes safe energy supply as the actual dust and SO2 concentrations in certain industrial areas exceed these new limits, implying that power plants can not be built as long as the concentration standards are exceeded. While the possibilities of reducing SO2 loads by the use of higher stacks and flue gas desulfurization are economically limited and technically not fully feasible, the use of low-sulfur coal, preferably by mixing different types of coal, will be the principle approach to SO2 emission abatement.

45395 APTIC NO. 68256

Hurter, Donald A.

A STUDY OF TECHNOLOGICAL IMPROVEMENTS IN MOTOR VEHICLE FUEL CONSUMPTION. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 4.1-4.10. (Nov. 4-8, Paper 4.)*

Standard and compact reference vehicles were used to determine potential improvements in automobile fuel consumption resulting from technical innovations. Operation of the reference vehicles was computer-simulated to predict fuel usage and vehicle performance. Emission requirements used for the study were the 1977 standards: 0.41 g/mi hydrocarbons, 3.4 g/mi carbon monoxide, and 2.0 g/mi nitrogen oxides. Individual technical innovations found to improve fuel economy were: reduction in the weight of the body/chassis, reduction in body drag, improvement in engine-to-transmission load matching, and engine efficiency improvement. Combinations of improvements in the body and tires amounted to 10%, while engine-transmission improvements amounted to 12-18%. Fuel economy gains for the lean burn, stoichiometric (closed-loop), stratified charge, and diesel engine concepts were, respectively: 28%, 32%, 39%, and 47% for light-weight vehicles having radial tires, improved body construction, and modified automatic transmissions. The lean-burn concept resulted in the lowest total incremental cost to the first owner and for the life cycle of the vehicle (for both compact and standard-size cars). The stratified charge engine concept had the highest total incremental cost over the reference vehicles and required a fuel cost per gallon to break even of $0.63 (3 years) to $0.43 (10 years) for the compact car and $0.74 (3 years) to $0.41 (10 years) for the standard car. The goal of a 43% improvement in fuel economy (mpg) or a 30% reduction in fuel usage (gpm) for compact and standard sizes of vehicles appears attainable by the early 1980 s.

45396 APTIC NO. 68427

Jallouk, P. A., G. J. Kidd, Jr., and T. Shapiro

ENVIRONMENTAL ASPECTS OF COOLING TOWER OPERATION: SURVEY OF THE EMISSION, TRANSPORT, AND DEPOSITION OF DRIFT FROM THE K-31 AND K-33 COOLING TOWERS AT ORGDP. *Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tenn. Gaseous Diffusion Development Div. and General Engineering Div., Atomic Energy Commission Contract W-7405-eng-26, UC-22, Isotope Separation, 74p., Feb. 1974. 12 refs.*

NTIS: K-1859

The environmental aspects of cooling tower operation at the Oak Ridge Gaseous Diffusion Plant were evaluated. The quantities of chromium, calcium, magnesium, zinc, and phosphorus being introduced into the atmosphere as well as the deposition of these chemicals on the environs surrounding the cooling towers were measured. The drift emission characteristics of the K-31 and K-33 cooling towers were determined under a limited range of operating conditions. A drift fraction of between 0.08 and 0.12% was obtained for the K-31 tower. For the K-33 tower, the drift fraction was much lower due to the better condition of some of the drift eliminators the lower operating level, or both. The concentration of the elements in the drift is below the threshold limit values at the top of the cooling tower. The operation of the towers under present power loads has not and is not causing any underairable effect on the native vegetation surrounding the plant.

45397 **APTIC NO. 68546**

Kannappan, A.

CUMULATIVE SAMPLING TECHNIQUE FOR INVESTIGATING THE SCAVENGING PROCESS IN TWO-STROKE ENGINES. *Preprint, American Society of Mechanical Engineers, New York, 13p., 1974. 28 refs. (Presented at the American Society of Mechanical Engineers, Diesel and Gas Engine Power Conference and Exhibit, Houston, Tex., April 28-May 2, 1974, Paper 74-DGP-11.)*

Very little work has been done to investigate the progress of scavenging in a two-stroke engine cylinder. A simulated model was used to show that cumulative sampling is a simple and reliable technique to determine the progress of scavenging. Under cumulative sampling, samples of exhaust gases are collected during the exhaust period over different intervals, all of which start the commencement of blow-down. The method of analysis of the exhaust concentration/time distribution obtained is also given. The cumulative concentration distributions reveal the defects and other undesirable events happening during the scavenging of a two-stroke engine cylinder. (Author abstract modified)

45398 **APTIC NO. 68740**

Kant, F. H., A. R. Cunningham, and M. H. Farmer

EFFECTS OF CHANGING THE PROPORTIONS OF AUTOMOTIVE DISTILLATE AND GASOLINE PRODUCED BY PETROLEUM REFINING. *Exxon Research and Engineering Co., Linden, N. J., Office of Air and Waste Management Contract 68-01-2112, Program Element 1A2017, Rept. EPA-460/3-74-018, 53p., July 1974. 7 refs.*

NTIS: PB 236900/AS

The effects of changing the proportions of automotive distillate fuel and gasoline produced by petroleum refineries is examined to assess whether a shift to increased distillate production, which would be necessitated if there were widespread use of vehicles requiring distillate fuel, would result in significant improvements in resource utilization. Calculations for a grass-roots refinery, coming on stream in the 1990-2000 time frame, indicate that the maximum theoretical energy saving is about 2% of the crude oil charged when approximately equal quantities of automotive distillate and gasoline are produced. Savings in refinery investment and manufacturing cost would also be achieved. External considerations which require more study to resolve the question include: the extent of future derivation of syncrudes from coal or oil shale which are likely to contain a lower percentage of material boiling above middle distillate and the impact of changes in refinery processing on availability of chemical feedstocks.

45399 **APTIC NO. 69112**

Kennedy, A. M., N. J. Peet, J. C. Marlow, and K. J. Brown

SURVEY OF FUEL, ENERGY AND AIR POLLUTION IN THE CHRISTCHURCH URBAN AREA (1966-1973). *Canterbury Univ., Christchurch (New Zealand), Dept. of Chemical Engineering, 76p., Aug. 1974. 15 refs.*

Fuel usage, energy supply, and air pollution was surveyed in the Christchurch, New Zealand urban area from 1966 to 1973. Estimated emissions from fuels supplied to the area are tabulated for smoke, sulfur dioxide, hydrocarbons, and nitrogen oxides. Total emissions decreased slightly from 19,320 tons in 1966 to 17,842 tons in 1973. Smoke emissions decreased from 3640 tons to 2405, SO2 decreased from 5810 tons to 4038, hydrocarbons increased from 6790 tons to 7955, and NOx emissions were up from 3070 to 3874. Light and heavy fuel oils are the major source of sulfur emissions. Domestic coal burning is the main source of smoke emissions. In 1973, motor vehicles were responsible for 82% of hydrocarbon emissions and 52% of NOx. These emissions are not significant factors in total pollution, but are rising at a sufficiently high rate to justify continued monitoring of concentrations in the more crowded inner city streets.

45400 **APTIC NO. 69145**

Klumb, David L.

UNION ELECTRIC S SOLID WASTE UTILIZATION SYSTEM. *Preprint, Air Pollution Control Assoc. Pittsburgh, Pa., 17p., 1974. 3 refs. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., May 1974, Paper 74-94.)*

Particulate emission testing of a prototype solid waste processing system is described. The solid waste is processed into a supplementary fuel for use in electric utility boilers and recyclable noncombustible materials are recovered. The prototype led to the recent decision of the Union Electric Company to build, without government subsidy, a $70 million Solid Waste Utilization System capable of processing up to 8000 tons of solid waste per day generated by the St. Louis metropolitan area. The modest reduction in precipitator performance resulting from the supplementary firing of milled solid waste demonstrated that this system of refuse firing is practical insofar as particulate emissions are concerned. However, because of the inconclusive nature of some of the test results, a second precipitator test will be conducted. (Author abstract modified)

45401 **APTIC NO. 69019**

Konishi, Makoto

SOME PROBLEMS ON THE CURRENT ADHESIVES FOR WOODS. *(Saiki no mokuzai setchaku-zai no mondaiten). Text in Japanese. Setchaku (Technol. Adhes., Cohes. Sealing), 18(4):11-19, 1974.*

The adhesives used in the wood industry comprises 80% of the total adhesives consumption. The common types of resin adhesives are urea resin, melamine resin, phenol resin, vinyl acetate resin wood adhesives, and chloroprene rubber adhesives. The sources of pollution in wood industry are the waste water from cleaning equipment such as adhesive mixers and spreaders and the emission of solvents contained in adhesives and decomposition gases. Data on the estimated production resin adhesives for 1973 and the consumption ratio of adhesives by different industries are compiled along with data on water pollution by waste water from equipment cleaning processes. The atmospheric pollution by solvents is discussed in reference to the Los Angeles Rule 66 for solvent emission standards. The future prospect on solvent supply is discussed in reference to the petroleum oil crisis and in terms of production cost and price hike. The development of new types of pollutionless adhesives such as hot-melt, water base, emulsion, thermoplastic polymer base, and natural adhesives are discussed.

45402 **APTIC NO. 68676**

Matsuoka, Shin, Takeyuki Kamimoto, Hiroshi Murata, and Norio Hasegawa

STUDY ON GAS TEMPERATURE AND NITROGEN OXIDE CONCENTRATION OF A SPARK IGNITION ENGINE (REPORT NO. 1: CONSIDERATION OF TEMPERATURE DISTRIBUTION AGAINST OPTICALLY MEASURED TEMPERATURES). *(Hibana tenka kikan no gasu ondo to NO nodo ni kansuru kenkyu. (Dai-ichi-ho: Kogakuteki sokutei ondo ni taisuru ondo bunpu no koryo)). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, Osaka, p. 91-94, 1974. 6 refs.*

(Presented at the Japan Society of Mechanical Engineers National Meeting, 52nd, Osaka, Japan, Nov. 3-5, 1974, Paper 1416.)

In order to predict the amount of nitric oxide in spark ignition combustion systems and mixed combustion systems, an accurate temperature model was fashioned. For determining standard experimental values of high accuracy, gas temperature measurements were taken by light emission absorption methods, and the values were determined by using a shock wave tube. A trapezoidal model of temperature distribution was approximated, and the thicknesses of the temperature boundary layers in the direction of the diameter were determined. The predicted value of NO changed markedly when the presence of the boundary layers was acknowledged. The importance of considering temperature distribution rather than merely assuming an average gas temperature in the formation of a temperature model was shown. Equations, graphs, and schematic diagram of the experimental apparatus are included.

45403 **APTIC NO. 65757**

McMahon, A. D., C. H. Cotterill, J. T. Dunham, and W. L. Rice

THE U. S. ZINC INDUSTRY: A HISTORICAL PERSPECTIVE. *Bureau of Mines, Information Circ., no. 8629:1-76, 1974. 26 refs.*

GPO

The technology of the zinc industry from prospecting through refining is described with emphasis on the metallurgy involved in the various methods of smelting. The pyrometallurgical process for converting zinc sulfide into metallic Zn consists of roasting, sintering, and the pyrometallurgical reduction of zinc oxide. Typical Zn roasting operation are tabulated including the percent of sulfur dioxide and dust in the offgas from eight roasters: Multihearth, 5-15% dust, 4.5 to 6.5% SO2; a combination multihearth Dorr-Oliver fluid bed, 5-15% dust, 4.5 to 6.5% SO2; fluid bed (Dorr-Oliver), 70-80% dust and 7-8% SO2; Ropp, 5% dust and 0.7 to 1.0% SO2; fluid bed (Dorr- Oliver) and multihearth combination, 75-85% dust and 10-12% SO2; fluid bed (Lurgi), 50% dust and 9-10% SO2; suspension, 50% dust 8-12% SO2; and fluid column, 17-18% dust and 11-12% SO2. Both dust and SO2 are also present in the offgas from sintering operations. The percent of dust can be 5, 5-7, or 5-10% depending on the size of the machine, while the percentage of SO2 can be 1.5-2.0, 0, or 1.7-2.4%. In the Imperial Smelting reduction process, the gases leaving the condenser are scrubbed with water, and the carbon monoxide is used to preheat the air and coke for combustion in the furnace. Any lead present in the charge collects at the bottom of the furnace together with the molten gangue material. The furnace is tapped periodically, and the mixture of Pb bullion and slag is separated in a fore hearth. The Pb collects any precious metals present, and copper is also recoverable from the bullion.

45404 **APTIC NO. 69099**

Merenda, Joseph

UNREGULATED EMISSIONS FROM CATALYST-EQUIPPED CARS-EPA OVERVIEW. *Preprint, National Inst. of Health, Research Triangle Park, N. C., National Inst. of Environmental Health Sciences and Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Development, 5p., 1974. (Presented at the Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Durham, N. C., April 16-19, 1974.)*

An overview is presented on progress regarding sulfate measurement methods, sulfur fuel analysis, sulfate control methods, and sulfate and noble metal emissions from automobiles equipped with catalytic converters.

45405 **APTIC NO. 68516**

Montani, E., P. Garibaldi, R. Vitali, and M. Zerra

LEAD COMPOUNDS IN GASOLINE ENGINE EXHAUST GASES. PART 2: GRANULOMETRIC DISTRIBUTION OF THE PARTICLES AS A FUNCTION OF THE GASOLINE LEAD CONTENT. *(Composti di piombo nei gas di scarico dei motori a benzina. II. Distribuzione granulometrica del particolato in funzione del tenore in piombo della benzina). Text in Italian. Riv. Combust., 28(1):17-27, Jan. 1974. 16 refs.*

Test stand analyses of the granulometric distribution of lead particles emitted by a Fiat 125 S gasoline engine as a function of the gasoline lead content (0.15, 0.30, 0.040, and 0.60 g/l) are described. The granulometric distribution was determined by an Andersen 8-step cascade compactor and scanning electron microscopy. Regardless of thy operating conditions of the engine, the size of the emitted lead particles ranged from 0.1-60 micron. The coarsest fractions retained on the first plates of the impactor were prevalently in aggregate form, while the fractions sampled on the fifth and subsequent plates were mostly globular. In addition, particles smaller than 0.2 micron were found on all plates of the impactor. Some 5-7% of the emitted lead, most probably a submicronic fraction, escaped the impactor. The variations of the lead content in the gasoline had no marked effect on the granulometric distribution of the lead emitted. The particle sizes determined by the cascade impactor has mean aerodynamic diameters were in good accordance with the real geometric diameters determined by the electron microscope.

45406 **APTIC NO. 68693**

Murata, Tomijiro

ENVIRONMENTAL POLLUTION BY PETROLEUM. *(Sekiyu ni yoru kankyo osen). Text in Japanese. Kagaku Kyoiju (Chem. Educ.), 22(3):213-219, June 1974. 9 refs.*

Pollution causes, cases, and remedies at various stages of petroleum production and usage are reviewed. Petroleum extraction (off-shore drilling and Arctic drilling) can be accompanied by mishaps. In 1971, IMCO (an international safety committee) proposed the partitioning of oil tanker holds into smaller compartments to minimize spillage in case of disaster. Although the solubility of oil in waste water from refineries is reckoned by ppm, the total amount dissolved is not negligible. Petroleum storage and transport on land is complicated by problems of safety in terms of population density as well as by pollution problems. Petroleum end-products such as plastic trash and automobile exhausts contribute to pollution. The role of aldehydes and peroxides in photochemical smog formation must be investigated further. Proper treatment of pollution at each specific point of occurrence, rather than at the end of a production line is recommended. Pollutant concentration for treatment, rather than pollutant dilution for dispersal, should be considered. Technology for pollution abatement is available, but not always economically feasible.

45407 **APTIC NO. 68532**

Nakano, Michio

THE AIR POLLUTION CONTROL BASIC PLANS FOR OSAKA (II). *(Osaka- shi no taiki osen boshi kihon keikaku (II)). Text in Japanese. Kagaku to Kogyo (Tokyo) (Chem. Chem. Ind.), 48(5):11-19, 1974.*

For fixed pollutant sources, the emission quantity of sulfur oxides, nitrogen oxides, and particulate matter (PM) for 1972, 1975, 1978, and 1981 was estimated from the estimated gross national product and fuel consumption. For the mobile pollutant sources, the emission quantity for carbon monoxide, NOx, and PM was estimated from the number of automobiles, fuel sales, road area, and trip number. For fixed sources, pollution control programs based on conversion to low sulfur fuel and desulfurization for SOx, fuel conversion and modification of combustion method for NOx, and conversion to gas fuel, high efficiency dust collectors, and process modification for

PM are described with case studies. For mobile sources, control programs based on the reduction in pollutant emission from automobiles to meet emission standards and direct or indirect reduction in traffic volume are described. The data on estimated decreases in pollutant emission by the enforcement of 1973, 1975, and 1976 emission standards are compiled. The control programs for Osaka city were designed to attain reductions in SOx, NOx, and PM from fixed sources and CO, NOx, and PM from mobile sources by 1972 and 1981. The reinforcement in atmospheric pollution monitoring systems, relationship to the master plan for the city, enforcement by laws and ordinances and modification in administrative procedure are discussed.

45408 **APTIC NO. 68951**

Neiser, J. and V. Masek

RELATIVE MOLECULAR WEIGHT AND SPECTRAL ANALYSIS OF TAR SUBSTANCES IN THE AIR OF WORKING PLACES OF COKING PLANTS. *(Relatives Molekulargewicht und Spektralanalyse der Teersubstanzen in der Luft der Kokerei-Arbeitsplaetze). Text in German. Zentr. Arbeitsmed. Arbeitsschutz, 24(9):261-266, Sept. 1974. 3 refs.*

Results of earlier measurements have yielded a relatively high concentration of tar substances in the air of a coke furnace and in its vicinity. Therefore, the quality of coking plant tar substances were determined in greater detail. Four samples were taken in a hard coal coking plant (one in the coal treatment station, two at the furnaces, one in the coke sorting station) and one sample was taken in a pitch coking plant (at the furnace). The relative molecular weight was determined by means of the light scattering method. Furthermore spectral analyses in the ultravioles, infrared and visible wave ranges were performed. The examined tar substances had molecular weights ranging from 1490 to 3400 and consisted almost exclusively of aromatic compounds with varying contents of some types of keto compounds and hydroxyl groups. Further research work regarding the detailed composition of the tar substances is required.

45409 **APTIC NO. 68984**

Ojima, Toshio, Koichiro Nezu, Hiroto Kitawaki, and Yuzuru Hirose

BASIC INVESTIGATIONS ON ARTIFICIAL HEAT EMISSION (1). INVESTIGATION AND ANALYSIS OF HEAT CONSUMPTION AND HEAT EMISSION STRUCTURES OF SUPPLY AND TREATMENT FACILITIES. *(Jinko netsu haishutsu ni kansuru kiso chosa (sono 1). Kyokyu shori shisetsu no netsu shohi, netsu haishutsu kozo ni kansuru chosa kaiseki). Text in Japanese. Preprint, Japan Society of Architecture, Tokyo, p. 295-296, 1974. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4148.)*

Heat consumption and heat emission structures of fifteen steam power plants and fifteen trash-burning facilites were investigated. These facilities were chosen because of their future possibilities as heat recovery and recycling sources. Investigations were conducted from December 1973 to March 1974. The maximum power generated per power plant was 1.054 MW. The nominal capacity per trash burning facility was 530 tons/day. The yearly rate of operation for steam plants averaged from 60 to 70%; for trash-burning facilities, the average was 70-80%.

45410 **APTIC NO. 68985**

Ojima, Toshio, Yuzuru Hirose, Koichiro Nezu, and Hiroto Kitawaki

BASIC INVESTIGATIONS ON ARTIFICIAL HEAT EMISSION (2). INVESTIGATION OF HEAT CONSUMPTION AND HEAT EMISSION STRUCTURES AT LARGE PLANTS (1). *(Jinko netsu haishutsu ni kansuru kiso chosa (sono 2). Daikibo kojo no netsu shohi, netsu haishutsu kozo ni kansuru chosa kenkyu (1)). Text in Japanese. Preprint, Japan Society of Architecture, Tokyo, p. 297-298, 1974. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4149.)*

Consumption and emission of thermal energy from 1972 to 1973 at large plants were investigated with respect to time, temperature, and amount of heat. Questionnaires were sent to 101 plants, each employing more than 100 persons. Thirty-nine replies were tabulated. The industries included milk products, cotton yarn, paper and pulp, petroleum products, tire, glass, steel, aluminum, household electrical appliances, and automobile. Tables were made of the temperatures of steam and heat treatment, the processes involved, and the hours of the day during which the plants were in operation. Thermal energy consumption per person, per 1000 sq m of plant area, and per $3800 production are presented.

45411 **APTIC NO. 68986**

Ojima, Toshio, Hiroto Kitawaki, Koichiro Nezu, and Yuzuru Hirose

BASIC INVESTIGATIONS ON ARTIFICIAL HEAT EMISSION (3). INVESTIGATION OF HEAT CONSUMPTION AND HEAT EMISSION STRUCTURES AT LARGE PLANTS (2). *(Jinko netsu haishutsu ni kansuru kiso chosa (sono 3). Daikibo kojo no netsu shohi, netsu haishutsu kozo ni kansuru chosa kenkyu (2)). Text in Japanese. Preprint, Japan Society of Architecture, Tokyo, p. 299-300, 1974. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4150.)*

Heat balance models for various industries during a one-year period were constructed from data described in a previous article. Total heat input (100) was the sum of the heat expended from fossil fuel usage and amount of electricity consumed. After various energy exchanges, heat was assumed to be emitted into the water and the atmosphere. In general, industries using steam have their own generators, and the amount of heat emitted into water is large. There are only few industries equipped with heat reduction boilers. Those industries with high-temperature, heat-producing equipment such as furnaces usually exhaust heat into the air. Specific examples are listed.

45412 **APTIC NO. 68990**

Ojima, Toshio and Yuji Hasemi

STUDIES OF HEAT DIFFUSION AT CITY SCALE. (4) EVALUATION OF NATURAL-DRAFT, WET-TYPE COOLING TOWER AND THE PROBLEM OF FOG FORMATION. *(Toshi kibo netsu kakusan ni kansuru kenkyu. (Sono 4) Shizen tsufu shisshiki reikyakuto no seino hyoka to kiri hassei mondai ni tsuite). Text in Japanese. Preprint, Japan Society of Architecture, Tokyo, p. 311-312, 1974. 2 refs. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4156.)*

The problem of heat emission from steam power plants was simulated with a model of a natural-draft, wet-type cooling tower. Fog formation from use of the equipment was also calculated. The Japanese climate is unsuited for use of natural-draft cooling towers which are currently in use in Western Europe. Seasonal adaptations are necessary.

45413 **APTIC NO. 68839**

Pavoni, Joseph L., D. Joseph Hagerty, and John E. Heer, Jr.

A SURVEY OF EUROPEAN SOLID WASTE MANAGEMENT TECHNIQUES. *Louisville Univ., Speed Scientific School, Ky.; International Assoc. for Pollution Control; American Chemical Society, Washington, D. C.; American Inst. of Chemical Engineers, New York; American Inst. of Industrial Engineers, New York; American Society of Civil Engineers, New York; American Society of Mechani-*

cal Engineers, New York; American Water Works Assoc., New York; Inst. of Electrical and Electronic Engineers, New York; and Water Pollution Control Assoc., Environ. Eng. Sci. Conf., Annu., Meet. Louisville, Ky., 1974, p. 441-459. 26 refs. (March 4-5.)

A number of observations are made about European solid waste management techniques based on findings of a field investigation of 15 solid waste disposal and resource recovery systems in six western European countries. Solid waste characteristics, refuse disposal facilities, and resource recovery systems are discussed. The approach to refuse management in most European countries is very professional, with personnel drawn from civil service organizations. Political considerations in the staffing of waste management positions appear to be negligible. There does not appear to be as great an emphasis on environmental protection in European waste management as in American. The primary emphasis in Europe is placed upon reliable and efficient refuse collection and disposal. The composition and generation rates of refuse in Europe are significantly different than in the U. S. European refuse in general contains more organic matter and less paper and plastics, but paper and plastics are appearing increasingly. Because of the increase in combustible materials, the heat content of European refuse is increasing, although it is still significantly lower than the heat content of American refuse. European refuse is more valuable as a substitute fuel, however, because of the greater cost of fossil fuels in Europe. An entirely different set of economic conditions govern European refuse management, but many of the problems are the same. Solutions to problems will probably be different in the U. S. than in Europe, since most European waste management is carried out by governmental or semipublic utilities rather than by private contractors. The most successful European operations are those which are most simple. The success of energy recovery through heat recovery in European incinerations seems to indicate a large potential for similar operations in the U. S. Optimum systems for refuse collection and disposal in any area may incorporate a combination of incineration, composting, and landfill. (Author summary modified)

45414 **APTIC NO. 68458**

Rasmussen, R. A.

EMISSION OF BIOGENIC HYDROGEN SULFIDE. *Tellus (Uppsala), 26(1-2):254-260, 1974. 15 refs.*

The biogenic production of gaseous sulfur compounds from terrestrial and marine sources were investigated. Gas chromatographic analyses using a flame photometric detector specific for sulfur at 394 nm indicate that dimethyl sulfide (DMS) and dimethyldisulfide (DMDS) are the major compounds in the gaseous emissions from bacteria and fresh water green and blue-green algae isolated from different soil types and eutrophic as well as naturally clean waters. Analysis of the S gases in a wide variety of sea water samples and those released by red, green, and brown seaweeds indicate that organic S emissions dominate over hydrogen sulfide. It was hypothesized that the micro-biota in the various natural systems like soil, leaf litter, lakes, ponds, rivers and the ocean produce predominantly organic sulfides, and that the reported observation of H2S emissions from water logged soils and anaerobic muds is related to their low pH. Presumably the biogenic production of gaseous S compounds constitutes a major input in the S cycle. The source of strength and spatial distribution of these sources are unknown. (Author abstract modified)

45415 **APTIC NO. 68791**

Reiquam, Howard, Norbert Dee, and Paul Choi

FINAL REPORT ON DEVELOPMENT OF CROSS-MEDIA EVALUATION METHODOLOGY (FINAL REPORT) VOLUMES I AND II. *Battelle Memorial Inst., Columbus, Ohio, Columbus Labs, Council on Environmental Quality and Environmental Protection Agency Contract EQC315, 22p., Jan. 15, 1974. 73 refs.*

NTIS: PB 232414

A method for evaluating the cross-media impact (air, water, and land) of specific control technologies or strategies is described. The methodology uses a strategy effectiveness index which is obtained by subtracting the impact resulting from a particular control strategy from the impact resulting from no control. This impact is defined by an environmental degradation index which is a function of the magnitude of damages created by pollutants and of the relative importance or significance of the respective damages to the environment. Data are assembled and applied to case studies of 1000 MW coal-fired power stations and 1000 tons/day kraft pulp mills. The data assembled consist of the production rates of primary pollutants to each of the three media and of secondary pollutants due to the application of each control strategy. Costs associated with each strategy are also presented. Similar sets of data are assembled for an integrated iron and steel production facility which was examined as a test of the methodology.

45416 **APTIC NO. 69826**

Saito, Hiroshi and Katsuhiko Uchibori

ANALYSIS OF ALDEHYDES IN AUTOMOTIVE EXHAUST GASES. *(Jidosha haiki gasuchu no arudehido no bunseki). Text in Japanese. Nisseki Rebyu (Nisseki Tech. Rev.), 16(3):221-227, July 1974. 9 refs.*

The analysis of aldehydes from automotive exhaust gases was effected by gas chromatography. By modifying the DNPH-GC method (2,4-dinitrophenylhydrazine), aldehyde concentrations of 0.5 ppm in 1 liter of exhaust gas were detected. For C3 carbonyl compounds, propionaldehyde and acrolein peaks were differentiated by means of two-stage gas chromatography. In 5 ml of exhaust gas, 0.1 ppm of compounds were detectable. The concentration composition of the aldehyde emission remained fairly constant under normal driving conditions and 10-mode driving conditions. Formaldehyde concentration was highest; concentrations of acetaldehyde, acrolein, and aromatic aldehydes were quite small; other carbonyl compounds were present in trace amounts. By using the 10-mode exhaust gas test (CVS method), it was found that as the concentration of aromatic compounds in the fuel increased, the total aldehyde concentration in the exhaust gases decreased. When the olefin content in the fuel was increased, the concentration of aliphatic aldehydes increased, but there was hardly any effect on the concentration of acrolein or aromatic aldehydes. Platinum oxide catalyst eliminated more than 80% of the aldehydes in the exhaust gas. Fuel composition and type of engine (rotary or reciprocating) had little effect on the total aldehyde emission tendencies.

45417 **APTIC NO. 68728**

Sawanobori, Tatsuhiko

HYDROGEN CHLORIDE GAS POLLUTION FROM WASTE INCINERATORS. *(Gomi shokyakuro niyoru HCl gasu osen). Text in Japanese. Preprint, Japan Society of Heating, Air-Conditioning and Sanitary Engineers, p. 59-62, 1974. (Presented at the Japan Society of Heating, Air-Conditioning and Sanitary Engineers Annual Meeting, Tokyo, Japan, Oct. 7-8, 1974, Paper A-15.)*

Characteristics of waste are generally described in terms of the calorific value, combustible component, non-combustible component, and moisture content. The data on yearly changes in the characteristics, amount of waste disposal, and plastic content in the waste from 1968 to 1973 in Sapporo are compiled. The hydrogen chloride concentration produced by the combustion of vinyl chloride type plastics from the presently operating incinerator (300 tons/day capacity) was measured by collecting samples at a height of 30 m. The measurement was made once a month on two to three samples, and the yearly average concentration was 380 ppm, while the maximum and minimum concentrations were 685 ppm and 123 ppm, respectively. Using the equation for wet combustion exhaust gas, the maximum HCl concentration calculated was 1860 ppm and the average HCl concentration was 790 ppm. The relationship between the HCl concentration and plastic content in waste was linear. The stack height of the incinerator used is 70 m, and the maximum and average HCl concentrations on ground level were calculated according to the Sutton s equation.

45418 **APTIC NO. 69025**

Schiffers, Ansgar

ARE LARGE WET COOLING TOWERS FRIENDLY TO THE ENVIRONMENT? *(Sind gross Nasskuehltuerme umweltfreundlich)? Text in German. Energie (Munich), 26(7/8):228-234, Aug. 1974. 10 refs.*

After a brief review of the existing cooling systems for waste heat from power plants, such as dry cooling and wet cooling, the effect of natural draft cooling towers with wet cooling on the environment is discussed. The water vapor leaving such cooling towers contains practically no salts or other pollutants since dust and gases such as sulfur dioxide are washed out by the intense contact of the waste air with the falling flow of water. A study of the atmosphere s capacity for dissolving water vapor reveals that it is extremely high and that the water vapor from even large cooling towers is negligibly small if a sufficiently good mixing with the ambient air takes place. Assuming a relative humidity of 75%, 15,000t/h of water can still be dissolved per one sq k at a wind velocity of 1 m/sec and a temperature of 20 C. The hourly emission of water vapor by a cooling tower is on the average 2500 tons. An investigation of the influence on precipitation also shows that within the larger neighborhood no higher precipitation occurs. This does not exclude the possiblity that in the immediate vicinity of the cooling tower the precipitation may rise. Solar radiation is diminished only by several minutes per sunny day through the cooling tower operation and fog lifts 20 min later on foggy days with four to six hr of fog. As an advantage the compensation for natural evaporation which is gradually diminshed by increasing urbanization must be named.

45419 **APTIC NO. 68912**

Shacklette, Hansford T., Josephine G. Boerngen, and John Keith

SELENIUM, FLUORINE, AND ARSENIC IN SURFICIAL MATERIALS OF THE CONTERMINOUS UNITED STATES. *U. S. Geol. Surv. Circ., no. 692: 1-14, 1974. 33 refs.*

Concentrations of selenium, fluorine, and arsenic in 912, 911, and 910 samples, respectively, of soils and other regoliths from sites approximately 50 miles apart throughout the U. S. are represented on maps by symbols showing five ranges of values. Histograms of the concentrations of these elements are also given. The geometric mean concentrations in the samples are 0.31, 0.25, and 0.39 ppm selenium for the entire U. S., the western U. S., and the eastern U. S., respectively; 180, 250, and 115 ppm fluorine, respectively; and 5.8, 6.1, and 5.4 ppm arsenic, respectively. Selenium in soils may be derived from parent material weathered from the underlying rock, from wind- or water-deposited seleniferous materials, from ground or surface water by precipitation, from volcanic emanations brought down by rain, and from sediments derived from mining operations. Fluorine is added to soils from atmospheric fallout from industrial activity, by volcanic ejecta, or by the application of phosphate fertilizers and other fertilizers containing slag. Arsenic in soils can result from agricultural practices, industrial operations, burning of coal ash containing As, smelters, and arsenic insecticides. The analytical methods used to determine selenium, fluorine, and arsenic were X-ray fluorescence, fluoride specific-ion electrode, and spectrophotometric-isotope dilution methods, respectively. (Author abstract modified)

45420 **APTIC NO. 68723**

Shiojima, Nobumasa

COMBUSTORS AND HEAT ENGINES. *(Nensho kiki netsu kikan). Text in Japanese. Nenryo Koykaishi (J. Fuel Soc. Japan (Tokyo)), 53(6):514-522, June, 1974.*

construction of power plants as well as boilers peaked between 1971 to 1974, at an annual rate of increase in capacity of 7000 MW. It is expected to decrease from 1975 on duue to the stabilization of the economy and pollution restriction. More electric companies plan to use liquefied natural gas which does not contain sulfur or nitrogen. The consumption of light oil is also expected to increase sharply, reaching 16% of the total fuel consumption in 1975. Direct and indirect desulfurization techniques were developed and improved so that their utilization has been satisfactory. Large scale flue gas desulfurization apparatus are also widely employed and new techniques for nitrogen oxides prevention, such as two-stage combustion and flue gas mixing combustion, are under active study and development. Boilers emitting less than 40,000 N cu m/hr of exhaust gas are not subjected to government regulation for NOx emission, however, local governments may request certain emission standards for these small boilers. The most effective method found so far for NOx prevention is the use of low N-content fuel.

45421 **APTIC NO. 68755**

Soldano, B. A., P. Bien, and P. Kwan

THE EFFECT OF METEOROLOGICAL AND SPATIAL PARAMETERS ON THE CONCENTRATION OF VARIOUS SPECIES OF MERCURY AND ITS COMPOUNDS. *Preprint, National Science Foundation-RANN, Washington, D. C., 10p., 1974 (?). 11 refs. (Presented Trace Contaminants Conference, 2nd Annual, Oak Ridge, Tenn.)*

A field study to ascertain whether or not alternative mechanisms to the fish cycle provide a practical basis for mercury methylation was conducted using both air and water samples. Central sewage facilities appeared to constitute a widespread source of organic mercury as well as elemental mercury emissions. On the other hand, tests of leached material around a coal-fired power plant indicated that mercury was efficiently trapped by the formation of sulfides. Air sample measurements in cities with populations ranging from 20,000 to 700,000 indicated inorganic and elemental mercury emissions covering a concentration range greater than seven powers of 10. The concentration of elemental mercury in the atmosphere fell off sharply with increasing distance from the central sewage plants investigated, but the concentration of the more volatile organic forms of mercury increased (for at least several miles) logarithmically with distance. The concentration maxima of the organic mercury emissions appeared to be related to population size. The evidence suggested that the Environmental Protection Agency upper limit for mercury in air is being exceeded under certain conditions. (Author abstract modified)

45422 **APTIC NO. 68935**

Statnick, Robert M.

MEASUREMENT OF SULFUR DIOXIDE, PARTICULATE, AND TRACE ELEMENTS IN COPPER SMELTER CONVERTER AND ROASTER/REVERBERATORY GAS STREAMS (FINAL REPORT). *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., ROAP 21ADM-012, Program Element 1AB012, Rept. EPA-650/2-74-111, 92p., Oct. 1974. 33 refs.*

The results of the analysis of data on particulate, sulfur dioxide, and trace element emissions and control efficiencies for a copper smelter are given. The SO2 emission rates from the roaster/reverberatory and converter effluent streams were 518 and 587 lbs/min, respectively. The acid plant s SO2 control efficiency was 96.8%. The mass collection efficiency of the converter s electrostatic precipitator for dry filterable solids was 95%. The electrostatic precipitators had a minimum collection efficiency for dry filterable solids of 0.8-1.2 micron. Analyzing emitted particulate gave the following mass emission rates (in lbs/hr) for selected elements: arsenic (58.05), lead (24.65), cadmium (1.32), zinc (15.7), chromium (0.065), and copper (4.825). Control efficiency for the analyzed elements was between 90 and 98%. An appendix presents methods for sampling and analysis of mercury vapor in industrial streams containing SO_2. (Author abstract modified)

45423 **APTIC NO. 68845**

Stephens, N. Thomas, A. Keith Furr, Charles R. Thompson, and Richard L. Charter

TRACE METALS IN EFFLUENTS FROM COAL-FIRED FURNACES. *Louisville Univ., Speed Scientific School, Ky.; International Assoc. for Pollution Control; American Chemical Society, Washington, D. C.; American Inst. of Chemical Engineers, New York; American Inst. of Industrial Engineers, New York; American Society of Civil Engineers, New York; American Society of Mechanical Engineers, New York; American Water Works Assoc., New York; Inst. of Electrical and Electronic Engineers, New York; and Water Pollution Control Assoc., Environ. Eng. Sci. Conf., Annu. Meet., Louisville, Ky., 1974, p. 701-717. 5 refs. (March 4-5.)*

The occurrence and fate of trace elements in effluents from coal-fired steam power generating facilities were studied. The study involved analysis of samples of pulverized coal, fly ash, bottom ash, and ash pond liquid and sediments for a variety of trace elements by neutron activation and atomic absorption methods. A mass balance on the elements was attempted based on solid effluents to ascertain the significance of various possible routes of escape for the liberated elements during the combustion process. A total of 56 samples were analyzed collected from seven boilers at three different power plants. Due to the relatively small sample sizes involved and the high variability of trace element composition in coals, statistically based sampling programs involving large numbers of samples will be required to provide more definitive data. Trace elements measured included aluminum, arsenic, cadmium, copper, mercury, magnesium, manganese, sodium, titanium, vanadium, zinc, nickel, lead, antimony, and selenium.

45424 **APTIC NO. 69039**

Waldbott, G. L. and W. Oelschlager

FLUORIDE IN THE ENVIRONMENT. *Fluoride Quart. Repts., 7(4):220-222, Oct. 1974. 3 refs. (Presented at the 5th I.S.F.R. Conference, April 8-11, 1973.)*

Preliminary data on determinations of fluoride in tobacco, detergents and other cleaning materials, certain kinds of dusts (wood, steel, fiberglass, and asbestos), pollen grains, and fertilizers are presented. The data concern mainly items to which one is exposed occupationally. Relatively large amounts of fluoride are found in fiberglass and its presence could be a factor in the irritating action of fiberglass on the mucous lining of the upper respiratory tract. Fluoride contained in steel dust is not likely to induce symptoms in humans, though fluoride might conceivably influence the production of red lung which is primarily caused by airborne iron oxide. Similarly, the presence of fluoride in asbestos might be a factor in the action of asbestos bodies in the lungs. Fluoride is present in minute quantities in pollen grains (approximately 3 ppm); not much pollen is likely to reach the lower air ways due to the size of the pollen (20-60 microns). Fluorides in detergents can reach certain food products when food-handling containers are not sufficiently rinsed. A person who smokes 30 cigarettes per day is estimated to inhale approximately 0.8 mg fluoride as compared to the 8-hour maximum allowable concentration values of 2.5 mg/cu m. Most occupational diseases are aggravated by smoking and even relatively minute amounts of tobacco smoke may, under certain conditions, contribute to respiratory illness.

45425 **APTIC NO. 68452**

Yamasaki, Fujio

POLLUTIONLESS PAINT FOR INDUSTRIAL COATING. *(Kogyo toso ni okeru kogai taisaku toryo). Text ing Japanese. Toso to Toryo (Finish Paint), Special Issue, p. 35-40, 1974. 2 refs.*

Paints, finishes, and their relationship to pollution are surveyed. Of the 1.4 million tons of paint manufactured in Japan in 1973, almost half contained organic solvents which could cause air pollution. Los Angeles County Rule 66 (R-66) should be helpful in the formulation of nationwide air pollution regulations for organic solvents in Japan. The paint consumption for 1973 indicated that about 50% of the paints were used in assembly-line coatings (machinery, vehicles, electric machinery, metallic products, wooden products). Much air pollution in assembly-line coating was the result of spraying processes. Methods of combating pollution include the use of other processes such as roller coating, dipping, and flow coating. Use of less solvent in spray coating by formulating sprays of high viscosity of low molecular weight is considered. Powder paints, NAD, water-soluble paints, and hydrodispersion have drawbacks, but are possible alternative techniques.

45426 **APTIC NO. 69047**

Yamate, Noboru

AIR POLLUTION BY AIRPLANES. *(Kokuki ni yoru taiki osen). Text in Japanese. Koku Kogai (Kenkyu to Taisaku) (Aeronautic Pollut. (Stud. Countermeas.)), 1(1):50-56, 1974.*

Two types of jet plane fuel are used, gasoline type JP-4 and kerosene type JP-5. Total emission and pollutants concentrations are dependent on the type of engine and flying modes. Planes flying at an altitude lower than 1000 ft are considered to contribute to the pollution on ground. A JT 3D engine emits 17.4 g/sec of carbon monoxide, 14.7 g/sec of hydrocarbons (calculated as methane), and 0.2 g/sec of nitrogen oxides at idling, but emits much more NOx and less CO and HC when taking off. A JT 9D engine emits 0.827 g/sec of NOx at idling but 94.0 g/sec when taking off. The hydrocarbons are mainly C9 to C13. Analysis of the exhaust gas in the exhaust pipe of JT 3D engine shows vanadium concentration as high as 1 g/cu m, iron 22.5 g/cu m, zinc 1.73 g/cu m, and cadmium 0.78 g/cu m. The total CO, HC, and NOx emissions of a Boeing 747 are equivalent to 341, 374, and 2787 1600 c.c. automobiles, respectively. An improved engine for Boeing 727, JT 8D emits 590 ppm CO, 200 ppm HC, and 7.4 ppm NOx at idling but less than 15 ppm CO, 1.3 ppm HC, and 98.0 ppm NOx when taking off. Measurements of pollutants at Tokyo international airport and its vicinities from Oct. 14 - Oct. 16, 1972 showed an average concentration of CO from 2.5 to 4.4 ppm, NOx from 0.020 to 0.087 ppm.

45427 **APTIC NO. 68727**

Yano, Hisato and Susumu Oikawa

AIR CLEANING PLAN FOR A BUSINESS BUILDING. (NO. 2 EMISSION OF NOX IN ROOMS). *(Jimusho biru no kuki joka keikaku. (Dai-2-ho Kyoshitsunai ni okeru NOx no hassei ni tsuite)). Text in Japanese. Preprint, Japan Society of Heating, Air Conditioning and Sanitary Engineers, p. 67-70, 1974. (Presented at the Japan Society of Heating, Air Conditioning and Sanitary Engineers Annual Meeting, Tokyo, Japan, Oct. 7-8, 1974, Paper A-17.)*

In the air cleaning planning for office buildings, the emission of various pollutants in the building cannot be ignored. The nitrogen oxides emission from cigarette smoking was investigated by the desk test and actual smoking test in a room. The NOx analysis procedures by the Saltzman method and chemiluminescence method are described with flow sheets. Based on the nitrogen dioxide and nitric oxide concentrations obtained, the emission quantities of NO_2 and NO per cigarette calculated were 0.015 and 0.068 ml/cigarette by the Saltzman method and 0.102 and 0.153 ml/cigarette by chemiluminescence. The absorption spectrum of Saltzman solution was in good agreement with that of sodium nitrite standard solution, indicating that the coloring of Saltzman solution was attributable to NO_2. In a sealed room with seven smokers, the NO_2 and NO concentrations were measured before and after the smoking by the above-mentioned two methods, and emission quantities of NO_2 and NO per cigarette were calculated. The frequency of ventilation measured based on the decrease in carbon dioxide or carbon monoxide concentration was 0.063 times/hr or 0.62 times/hr, respectively.

45428 **APTIC NO. 68677**

Yano, Toshiaki, Kenichi Ito, and Shoichi Fukazawa

ON THE LOW TEMPERATURE WARM-UP CHARACTERISTICS AND GAS EMISSION OF AUTOMOTIVE GASOLINE ENGINES (REPORT NO. 1: ON THE WARM-UP MODE, WARM-UP TIME, AND QUANTITY OF CARBON MONOXIDE EMISSION).. (Jidosha yo gasorin kikan no teion danki tokusei to gasu ni tsuite (Dai-ichi-ho: Danki modo to danki jikan, CO haishutsuryo ni tsuite). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, Osaka, p. 87-90, 1974. 3 refs. (Presented at the Japan Society of Mechanical Engineers National Meeting, 52nd, Osaka, Japan, Nov. 3-5, 1974, Paper 1415.)

According to the 1974 national emission gas regulations of Japan, automobile engines are to be fully operational 26 sec after ignition. However, in cold areas (temperatures of -10 to -20 C), a warm-up period of 5-10 min is necessary. The effects on warm-up time, fuel consumption, and carbon monoxide emission by changes during the warm-up period in carburetor characteristics and warm-up mode were examined. The experimental engine was a 4-cylinder, 4-cycle, automotive gasoline engine with a displacement of 1584 cc, and compression ration of 8.7. A schematic diagram of the experimental setup and graphs of the experimental results are included in the report. Engine performance during low-temperature warm-up depended on the size of the choke valve opening in the carburetor. A suitable automatic choke arrangement would be most effective for obtaining optimum warm-up conditions. However, the carburetor arrangement must be compatible with the warm-up characteristics of the catalytic system, and could lead to higher levels of CO and hydrocarbon emission.

45429 **APTIC NO. 68552**

Environmental Protection Agency, Washington, D. C. and
Federal Energy Administration, Washington, D. C.

GAS MILEAGE GUIDE FOR NEW CAR BUYERS 1975. *11p., Sept. 1974.*

The estimated fuel economy of over 250 new car line and engine combinations that meet the 1975 emission standards and were certified for sale in the U. S. as of Sept. 15, 1974 is presented. Additional models will be certified later this year, and a second edition of the booklet is planned for early 1975 to include these subsequently certified cars. The cars tested were prototypes of the 1975 cars which the Environmental Protection Agency tested in its own laboratory to assure compliance with air pollution standards or which were tested by manufacturers and the results approved or confirmed by EPA. The cars were tested by professional drivers on a dynamometer. Two tests were run on each car -- a city driving test and a highway driving test. Factors influencing fuel economy which might cause a driver to get different results than those obtained in the tests are vehicle weight, optional equipment, driving habits, and engine conditions.

45430 **APTIC NO. 68626**

THE PROBLEMS OF COMBUSTION IN CENTRAL HEATING STATIONS. *(Les problemes de combustion dans les chaufferies). Text in French. C.I.T.E.P.A. (Technical Interprofessional Study Center for Air Pollution) Etudes Documentaires 42, CI 796, 33p., 1974.*

Problems of combustion and emission abatement in industrial combustion equipment are discussed. Investigations in practice have shown difficulties in the control of the air excess coefficient, and in the automatic control of the fuel temperature as a function of viscosity, as well as lack of proper thermal insulation of the flue gas ducts and dust separators. The contaminant concentrations in heavy fuel oil No. 2 vary within a wide range, and so do the properties of this fuel depending on the refinery. The dust separators should be controlled as a function of the boiler load, i.e., the air consumption. The efficiency of dust separators was greatly influenced by the granulometric composition and the density of the dust particles.

45431 **APTIC NO. 68821**

Office of Air and Waste Management, Research Triangle Park, N. C., Office of Air Quality Planning and Standards

BACKGROUND INFORMATION FOR STANDARDS OF PERFORMANCE: ELECTRIC ARC FURNACES IN THE STEEL INDUSTRY. VOLUME 2: TEST DATA SUMMARY. *Rept. EPA-450/2-74-017b, 48p., Oct. 1974. 11 refs.*

NTIS: PB 237841/AS

Test results and visible emission measurement data are summarized for electric arc furnaces in the steel industry. The tested facilities, their operating conditions, characteristics of exhaust gas streams, and deviations from prescribed test procedures are described. Results of particulate matter and carbon monoxide tests are summarized. Stack tests were made on a 50- and 75-ton furnace producing alloy steels equipped with a baghouse. Two samples were collected above the center of a baghouse filter controlling emissions from 5 15-ton furnaces producing alloy steels. Samples were taken at several points in baghouse compartments above the bags in two 100-ton and one 75-ton furnace producing carbon and alloy steels. Carbon monoxide was measured on the inlet side of a scrubber used to control emissions from a 165-ton furnace producing carbon and alloy steels. Carbon monoxide was also tested at a 150-ton furnace producing carbon steel using a baghouse for emission control. Visible emissions were measured at two 120-ton furnaces producing carbon steels using two baghouses. Stack tests were conducted on three 100-ton furnaces, one 75-ton furnace, and one 50-ton furnace producing carbon, alloy, and stainless steels and using three baghouses. Tests were conducted on the baghouse inlet and on three stacks at two 25-ton furnaces producing alloy and stainless steels. A canopy hood baghouse at two 100-ton and one 150-ton furnaces producing carbon steels was also tested.

45432 **APTIC NO. 68823**

Office of Air and Waste Management, Research Triangle Park, N. C., Emission Standards and Engineering Div.

BACKGROUND INFORMATION FOR STANDARDS OF PERFORMANCE: PRIMARY ALUMINUM INDUSTRY. VOLUME 1: PROPOSED STANDARDS. *Rept. EPA-450/2-74-020a, 122p., Oct. 1974. 13 refs.*

NTIS: PB 237612/AS

The proposed standards of performance for primary aluminum plants and the rationale for the degree of control selected are described. Analytical methods for sampling emissions and the environmental and economic impact of the standards are discussed. During initial plant surveys, source measurements, and a later visit to Norway, seven primary aluminum reduction plants were observed to have visible emissions of about 10% opacity or less; four with dry control systems had no visible emissions. One domestic carbon anode bake plant had visible emissions of less than 20% opacity; another domestic plant had 10%. The Norwegian anode bake plant had about 10%. The primary standard was based on primary emissions which averaged less than 0.5 lbs TF/TAP (total fluoride/ton of aluminum produced) which were achieved on four plants; one foreign plant reported primary emissions of less than 0.5 lb TF/TAP. Three of the six tests of secondary systems showed average emissions of less than 1.25 TF/TAP, including two plants with elaborate sampling and flow measurement devices. Based on an assumed fluoride control efficiency of only 90%, emissions from carbon bake plants can be controlled to below 0.20 lb TF/TCAP. Data were obtained from plants in which the collection systems were upgraded and control systems retrofitted to an existing plant. New plants should easily be able to achieve the recommended standard of performance.

The economic impact upon the domestic primary aluminum industry of the standards is not considered to be adverse. The economic impact would be adverse if more stringent standards were to be imposed upon the industry. The proposed standard of 2.0 lb/TF/TAP is supported by measurement of emissions from potrooms. Control technology for anode bake plants is available to achieve 0.20 lb TF/TCAP. The standard will require installation and proper maintenance of equipment representative of the best technology which has been demonstrated for the industry. (Author summary modified)

45433 **APTIC NO. 68869**

National Academy of Sciences-National Academy of Engineering, Washington, D. C., Coordinating Committee on Air Quality Studies

AIR QUALITY AND AUTOMOBILE EMISSION CONTROL. VOLUME 3. THE RELATIONSHIP OF EMISSIONS TO AMBIENT AIR QUALITY. *93rd Congress (Senate), 2nd Session, Serial 93-24, 151p., Sept. 1974. 89 refs. (Prepared for the Committee on Public Works pursuant to S. Res. 135, approved Aug. 2, 1973.)*

GPO

The historical impact of motor vehicle and stationary source emissions on ambient air pollution concentrations and the degree of accuracy with which present scientific information and methodology predict the impact of alterations in emission patterns on ambient air quality were studied. Emission inventories, atmospheric processes (including transport, dispersion, chemical transformations, and removal processes), monitoring ambient air quality (instrumentation, site selection, data collection, and stations), trends in emissions (sulfur oxides, particulates, carbon monoxide, nitrogen oxide, and nonurban and urban photochemical oxidants), models for predicting ambient air quality and their applications, and applications of modeling to air quality strategy for carbon monoxide and chemically reactive pollutants are discussed. The report answers the following questions: Are there nationwide emission data which accurately characterize emission trends? Are there nationwide air monitoring data which adequately characterize ambient air quality? What influence have control measures had on emission trends? What techniques exist for predicting the relationship between emissions and air quality? What is the recommended method for relating emissions to air quality for each of the motor vehicle pollutants? Are the present motor vehicle emission standards set at an appropriate level in order to meet the ambient air quality standards for CO, hydrocarbons, nitrogen oxides, and oxidants?

45434 **APTIC NO. 68922**

Office of Air and Waste Management, Research Triangle Park, N. C., Emission Standards and Engineering Div.

BACKGROUND INFORMATION FOR STANDARDS OF PERFORMANCE: ELECTRIC SUBMERGED ARC FURNACES FOR PRODUCTION OF FERROALLOYS. VOLUME 2: TEST DATA SUMMARY. *Rept. EPA-450/2-74-018b, 55p., Oct. 1974. 21 refs.*

NTIS: PB 238077/AS

Test results and visible emission measurements on electric submerged arc furnaces for production of ferroalloys are described. The background information and rationale used in the development of proposed standards of performance and the economic and environmental impacts of the standards are discussed. The operating conditions of the tested facilities, characteristics of the exhaust gas streams, deviations from prescribed test procedures, and results of particulate matter and carbon monoxide tests are presented. Results are given of tests of electric submerged arc furnaces producing ferromanganese equipped with various types of control methods including venturi and centrifugal scrubbers, settling chambers, baghouses, fume hoods, electrostatic precipitators, and flares.

45435 **APTIC NO. 68929**

Dept. of Transportation, Washington, D. C., Office of Administrative Services

MOTOR VEHICLE EMISSONS: A BIBLIOGRAPHY WITH ABSTRACTS. *Special Bibliography 9, Rept. DOT-HS-801-133, N48-52, 249p., March 1974. 1054 refs.*

NTIS: PB-232 235

A bibliography and abstracts of 1054 references on motor vehicle emissions are presented. The cited documents are in the National Highway Traffic Safety Administration (NHTSA) Technical Reference Division collection and can be examined there. Most of the publications were published in 1967 or later. Citations and abstracts are those that previously appeared in the NHTSA publication Highway Safety Literature. (Author abstract modified)

45436 **APTIC NO. 68941**

Office of Air and Waste Management, Research Triangle Park, N. C., Emission Standards and Engineering Div.

BACKGROUND INFORMATION FOR STANDARDS OF PERFORMANCE: COAL PREPARATION PLANTS. VOLUME 2: TEST DATA SUMMARY. *Rept. EPA-450/2-74-021b, 36p., Oct. 1974. 10 refs.*

NTIS: PB 237696/AS

The proposed standards of performance for coal preparation plants, and the rationale for the degree of control selected are presented. Analytical methods for sampling emissions, and the environmental and economic impact of the standards are discussed. Test results are presented on particulate matter emitted by five plants equipped with the best control equipment (venturi scrubbers and baghouses used to control emissions from thermal dryers and from air tables, respectively). The operating conditions, facilities, and characteristics of exhaust gas streams are also described.

45437 **APTIC NO. 68996**

Japan Science Council, Hokkaido Branch

ESTIMATED ENVIRONMENTAL DESTRUCTION ON THE LARGE SCALE INDUSTRIAL BASE PLAN FOR THE EASTERN AREA OF TOMAKOMAI. *(Tomakomai tobu daikibo kogyo kichi keikaku kara yosoku sareru kankyo hakai). Text in Japanese. Preprint, Japan Science Council, p. 39-40, 1974. (Presented at the Domestic Symposium for International Environment Preservation Science Conference, 2nd Tokyo, Japan, June 13-15, 1974.)*

The scale of the Tomakomai east industrial base plan is unparalleled in the world. The concentration of huge amount of raw materials and waste products and the resulting pollution problems are also unparalleled. The pollution control measures in the planning are critically evaluated. The inadequacy of air pollution assessment and the basic planning policy which contradicts the concept opposing the wide range pollution are pointed out. The significance of total emission regulation in the planning and the accuracy of the calculated estimation in the assessment are questioned. Treatment of industrial wastewater, changes in geographical condition resulting from dam construction, and the effect on plants and fishing industries are discussed.

1973

45438 **APTIC NO. 68810**

Burenin, N. S.

ROLE OF AUTOMOTIVE EXHAUST GASES IN POLLUTION OF THE AIR BASINS OF CITIES. *(K izucheniyu roli vykhlopnykh gazov avtotransporta v zagryaznenii vozdushnogo basseyna gorodov). Text in Russian. Tr. Glav. Geofiz. Observ., Leningrad, no. 293:231-239, 1973. 26 refs.*

General problems of motor vehicle-generated air pollution in urban areas, and experiments concerning exhaust emissions and exhaust gas dispersion are reviewed. Idle and maximum loads are chiefly responsible for the bulk of the harmful emissions, such as carbon monoxide. The assessment of air pollution generated by motor vehicles requires the knowledge not only of the overall fuel consumption and specific emission, but also of the operating conditions, type and speed of the automobile, the topographic conditions, and of the prevailing meteorological conditions. Close correlation between traffic density and carbon monoxide concentrations, especially in the morning and evening rush hours, was established. Increased nitrogen oxides, lead, and 3,4-benzo(a)pyrene concentrations were measured around traffic lights. Wind plays an essential role in the abatement of the exhaust component concentrations along streets.

45439 **APTIC NO. 68336**

Cirillo, Richard R. and Thomas D. Wolsko

HANDBOOK OF AIR POLLUTANT EMISSIONS FROM TRANSPORTATION SYSTEMS. *Argonne National Lab., Ill., Center for Environmental Studies, Rept. ANL/ES-28, 180p., Dec. 1973. 27 refs.*

Procedures for estimating the rate of air pollutant emissions from transportation systems are given, with emission factors and computation techniques being outlined for motor vehicles, railroad locomotives, aircraft, and waterborne vessels. The major emphasis is on motor vehicle emission computations, and data are given for model year emission rates, control device deterioration, and vehicle speed adjustments. Procedures for separating the cold start, computing evaporative emissions by source, and developing modewise emission factors are also presented. A computer program for calculating motor vehicle emission factors is illustrated along with a set of emission factor tables generated by the program. Aircraft emissions are described in the context of total airport emissions. Pollutants covered by the above procedures include: carbon monoxide, hydrocarbons, nitrogen oxides, particulates, and sulfur oxides. (Author abstract modified)

45440 **APTIC NO. 69159**

Gramms, Lorne C.

A STUDY OF THE IMPACT OF ODORS ON THE CITY OF CALGARY. *Strong, Lamb and Nelson Ltd., 81p., Jan. 1973. 18 refs.*

Telephone surveys and field observations were used to assess the origin and impact of odors in the Calgary area. Odors were mainly a problem in the industrial sections of the city, with transportation exhaust fumes receiving the most complaints during a winter odor survey. The level of the odors followed the transportation flow patterns, peaking during the morning and again during the late afternoon. Other sources of odors with high impact were: oil refineries, meat processing facilities, rendering plants, chemical plants, and stockyards. Some areas of the city were affected by local food preparation establishments. Sources of odor in the city requiring further monitoring include: fertilizer plants, iron foundries, oil reprocessing, and holding pens.

45441 **APTIC NO. 68417**

Kaplan, R. S. and G. W. P. Rengstorff

EMISSION OF SULFUROUS GASES FROM BLAST FURNACE SLAGS. *New York State Univ., Buffalo, Steel Ind. Environ., C. C. Furnas Mem. Conf., 2nd, Buffalo, N. Y., 1971, p. 199-224, 1973.*

Slags from blast furnaces usually come into contact with water either immediately after their removal from the blast furnace or during subsequent outside storage. The reaction between slag and water produces hydrogen sulfide and sulfur dioxide, among other gases which can be detected by odor. Results of research to suppress the formation of these sulfurous gases, particularly H2S, are described. The mechanism of H2S formation from blast furnace slag was studied in a laboratory and plant-scale trials. Additional laboratory experiments were made to explain the inconsistencies between the early laboratory work and the plant trials; the inconsistencies were not adequately explained. The mechanism of H2S formation is believed to be that a reducing film of hydrogen-water forms at the interface between the hot slag and water which causes H2S to form, and that later some of the H2S converts to SO2. It was suggested that slag has an overall deficiency of oxygen which may be filled by the oxygen from water, thereby releasing hydrogen. Based on this hypothesis, a laboratory investigation was conducted to determine whether adding oxygen to molten slag prior to granulation with water would suppress H2S and hydrogen formation. Laboratory experiments in which 10-pound batches of blast furnace slag were granulated showed that slag treatment with the oxidizing materials ferric oxide, carbon dioxide, calcium carbonate, open-hearth slag, or steam decreased the emission of H2S. In plant trials where commercial batches of blast furnace slags were treated with stream prior to water quenching of hot solid slag and molten slag, the stream treatment resulted in an increase in the emission of H2S.

45442 **APTIC NO. 68640**

Kemmetmueller, Roland

COKE PLANT. *(Kokereianlage und Verfahren zu deren Betrieb). Text in German. (Waagner-Biro AG, Vienna (Austria)) W. Ger. Pat. Appl. 2,304,541. 9p., Sept. 6, 1973. 13 refs. (3 claims).*

A coking process that eliminates risks of explosions or undesirable reactions between steam and coal products while at the same time avoiding moistening the coal and the subsequent burning of the coke in the dryer is described. An inert gas is used to dry the coal. The gas is heated in a heat exchanger by the quenching gas, after part of the latter s heat has already been used in a steam generator. The inert gas is preferably expelled into the atmosphere after cleaning and desulfurization.

45443 **APTIC NO. 68536**

Myers, P. S.

COMBUSTION PROBLEMS IN AUTOMOTIVE AIR POLLUTION. *Combustion Inst., Pittsburgh, Pa., Proc. Int. Symp. Combust., 14th, University Park, Pa., 1972, p. 871-881, 1973. 31 refs. (Aug. 20-25.)*

The role of combustion in the formation of air pollutants is discussed. Emphasis is given to automotive sources of nitrogen dioxide, carbon monoxide, and hydrocarbons, and the methods for reducing their emission from automobile engines. The effects of pollutants on human health generally include alteration of the ease with which oxygen reaches the blood, alteration of the oxygen-carrying capability of the blood, carcinogenic effects, and causation of side effects. Combustion is responsible for almost all of the man-made nitrogen oxides, most of the particulates, 3/4 of the sulfur oxides, 3/4 of the CO, and much of the HC. Pollutants from mobile and stationary sources are described. Meeting the 1975-1976 vehicle standards will require catalytic reduction of NOx plus catalytic oxidation of HC and CO. non-noble metals are not as effective as platinum catalysts and require larger weight% and surface areas. Catalyst poisoning and other problems are now being studied.

45444 **APTIC NO. 68595**

Newhall, H. K., R. E. Jentoft, and P. R. Ballinger

THE EFFECT OF UNLEADED FUEL COMPOSITION ON POLYNUCLEAR AROMATIC HYDROCARBON EMISSIONS. *Preprint, Society of Automotive Engineers, Inc., New York, 12p., 1973. 8 refs. (Presented at the Society of Automotive Engineers, National Combined Farm, Construction, and Industrial Machinery and Fuels and Lubricants Meetings, Milwaukee, Wis., Sept. 10-13, 1973, Paper 730834.)*

The effect of unleaded fuel composition on polynuclear aromatic (PNA) hydrocarbon emissions was investigated by operating three cars for approximately 8000 mi on each of four unleaded gasolines. These gasolines encompassed varied levels of carbon 6-C8 aromatics and varied PNA content. Exhaust PNA emissions and lube oil PNA content were measured periodically during the course of mileage accumulation. Increased in both light C6-C8 fuel aromatics and fuel contained PNAs can result in significantly increased exhaust PNAs. Vehicles meeting increasingly stringent hydrocarbon and carbon monoxide emissions standards emitted greatly reduced quantities of exhaust PNAs, though the rate of lube oil PNA accumulation appeared to be unaffected by emissions control systems. Accumulated lubricating oil mileage correlated with increased PNA emissions with a high level of statisitcal significance. This may be the result of an observed increased in lube oil PNA content with mileage accumulation. Oil change caused an immediate reduction in PNA emissions. (Author abstract modified)

45445 **APTIC NO. 69016**

Sakai, Tetsuo and Eiichi Ito

STUDIES ON VEHICLE EXHAUST (III) INVESTIGATIONS ON HYDROGEN CYANIDE AND FORMALDEHYDE IN THE EXHAUST EMISSIONS. *(Haiki gasu seibunni kansuru kenkyu (III) haiki gasuchu no shian, horumu arudehido ni tsuite). Text in Japanese. Nagoya-shi Kogai Kenkyushoho (Rep. Environ. Pollut. Res. Inst., City Nagoya), no. 2:39-42, 1973. 7 refs.*

Experiments were carried out to study the formation of harmful gases such as hydrogen cyanide and formaldehyde in automotive exhaust gas at various engine conditions. A gas sampler was placed inside the muffler and 15 ml of gas sample was obtained for analysis. Hydrogen cyanide was determined by the pyridine pyrazolone method and formaldehyde by the acetylacetone method. Hydrogen cyanide was emitted by gasoline engines having ignition timing adjusting devices; the HCN concentration was comparable to that emitted without the device. The formaldehyde concentration in exhaust gas from gasoline engines ranged from 3.70 ppm to 4.90 ppm at idling conditions. The HCHO concentration was significantly reduced by attaching a simple purification device B-1. An ignition timing adjusting device had little effect on HCN and HCHO reductions although it was very effective in reducing nitrogen oxides and hydrocarbons.

45446 **APTIC NO. 68766**

Sugasawa, Kiyoshi, Koji Tasaka, Keiho Hino, and Claus Flockenhaus

BLAST FURNACE TRIALS WITH FORMED COKE IN JAPAN. *(Verhuettungsversuche mit Formkoks in Japan). Text in German. Stahl Eisen (Duesseldorf), no. 1:24-31, Jan. 1973. 3 refs. (Translation available from Henry Brutcher Technical Translations, P.O. Box 157, Altadena, Calif., 91001, as HB 8967.)*

The preparation of formed coke by using high amounts of noncaking coal and (70-85%) binding agents, such as tar and pitch, and the use of this formed coke in full-scale blast furnace are described. The batch composed of nonbaking coal, a small amount of coking coal, and binding agent, is pressed into briquettes for subsequent at coking. Formed coke was used in a blast furnace of 1350 cu m volume at the Kokura works in Japan. The amount of formed coke was increased up to 50% of the total coke input, and it was possible to replace all conventional coke by formed coke in blast furnaces. Increase of the permeability index by about 10%, increased reactivity, and more uniform flow due to the formed coke charge were observed. The volatile matter content of the formed coke ranged from 22 to 29%, and the sulfur content was 0.4-0.6%. When formed coke was added at the rate of 50%, the carbon monoxide, carbon dioxide, and hydrogen contents in the throat gas were 21.4%, 21.7%, and 3.3%, respectively. The CO to CO2 ratio was 0.99.

45447 **APTIC NO. 68309**

Environmental Protection Service, Ottawa (Ontario), Air Pollution Control Directorate

A NATION-WIDE INVENTORY OF AIR POLLUTANT EMISSIONS. SUMMARY OF EMISSIONS FOR 1970 (FINAL REPORT). *Rept. EPS 3-AP-73-1, 18p., Jan. 1973.*

Estimates for 1970 nationwide (Canada) emissions of the primary air pollutants carbon monoxide, sulfur oxides, nitrogen oxides, hydrocarbons, and particulates are summarized in terms of source categories. Approximately 17.3 million tons of carbon monoxide were emitted in Canada during 1970, with gasoline-powered motor vehicles being the largest single emitter and accounting for approximately 74% of the national total. Industrial processes accounted for approximately 58% of the nation s total particulate emissions of approximately 2.3 million tons. Approximately 7.2 million tons of sulfur oxides were emitted during 1970, with more than 5.4 million tons being produced by industrial processes; the burning of fuels accounted for 22% of the sulfur oxides emitted. Motor vehicles accounted for 2.0 million tons or 65% of the national total of hydrocarbon emissions, and all transportation sources accounted for 76.8% of the total. About 1.4 million tons of nitrogen oxides were emitted in Canada during 1970, with transportation sources producing approximately 62% of the total. Fuel combustion in stationary sources was the second largest source with an emission of 431,000 tons.

45448 **APTIC NO. 68399**

Dept. of the Interior, Washington, D. C.

UNITED STATES ENERGY FACT SHEETS 1971 (FINAL REPORT). *144p., Feb. 1973. 2 refs.*

NTIS: N74-22610

Energy fact sheets for individual states and regions are presented to provide data on sources and consumption patterns (household, industrial, and transportation sector) of coal, petroleum, and natural gas. The principal data sources for fuel consumption are the 1971 annual Bureau of Mines Mineral Industry Surveys for coal, petroleum products, and natural gas. Data for electric power are derived primarily from publications of the Federal Power Comission. Broad-scale comparisons of fuel consumption and availability are made on a regional basis. Maps are provided to illustrate the location of fuel reserves in the nation. The report is designed to update and revise two similar publications on the nation s fuel-energy situation which were also published by the Department of Interior.

45449 **APTIC NO. 68813**

Fachkommission fuer Lufthygiene der Verinigung der Kessel- und Radiatoren-Werke Zuerich

ATMOSPHERIC POLLUTION FROM CENTRAL HEATING BOILERS. *(Ausbreitung luftfremder Stoffe in der Atmosphaere durch Zentralheizungskessel). Text in German. Schweiz. Bl. Heizung Lueftung, 40(1):13-16, 1973.*

General problems of air pollution generated by central heating boilers and ways of abating such air pollution are described. The flue gases of central heating boilers contain water vapor, carbon dioxide, carbon monoxide, sulfur dioxide, sulfur trioxide, and soot. In general, CO in the flue gas is an indication of low-efficiency combustion. The formation of SO3 is a function of the fuel sulfur content, the combustion chamber temperature, the air excess coefficient, and the presence of catalysts. The high-efficiency combustion of fuel oil, especially of light fuel oil, requires minimum quantity of excess air, correct atomization temperature and oil viscosity, fine, uniform atomization, and complete combustion. To minimize the total emission, the flue gases of modern central heating boilers should have soot numbers (according to Bacharach) between 1 and 2 for light fuel oil, and between 2 and 3 for the medium and heavy distillates. Central heating boilers should be equipped with sufficiently high stacks to achieve efficient dispersion of the flue gases. Modern firing equipment is able to meet the current hygienic requirements when properly installed and maintained.

45450 **APTIC NO. 68928**

International Research and Technology Corp., Washington, D. C.

PROBLEMS AND OPPORTUNITIES IN MANAGEMENT OF COMBUSTIBLE SOLID WASTES (FINAL REPORT). *Environmental Protection Agency Contract 68-03-0060, Program Element 1D2314, EPA-670/2-73-056, 526p., Aug. 1973. 157 refs.*

NTIS: PB-222 467

The management of combustible solid wastes generated by stationary sources is described. Technologies were evaluated for utilizing or disposing of these wastes and include incineration, pyrolysis, biological processes, mechanical processes, and application to land surfaces. Promulgation of emission standards for stationary sources of air pollution has had an indirect effect on incinerator operation and design. Air pollution control equipment consists usually of either wet scrubbers, bag filters, or electrostatic precipitators and tall chimney stacks. Five to 10% of the capital costs for an incineration system are for air pollution control equipment and 4-11% are for chimneys.

45451 **APTIC NO. 69118**

Oak Ridge National Lab.-National Science Foundation Environmental Program, Energy Team, Oak Ridge, Tenn.

ELECTRICAL ENERGY AND ITS ENVIRONMENTAL IMPACT. PROGRESS REPORT -- JUNE 30, 1973. *NSF Interagency Agreement AEC 40-237-70, NSF AG 398, 65p., July 1973. 53 refs.*

NTIS: ORNL-NSF-EP-55

The work of the Energy Team of the ORNL-NSF Environmental program for Jan. 1 through June 30, 1973 is summarized. The program places major emphasis on analysis of energy uses in the residential and transportation sectors. The efficiency and economics of room air conditioners are being studied. The energy cost of food is also being studied; it is several times larger than the energy content of food. A statistical analysis is being carried out of U. S. electricity demand growth. Work is now getting underway to construct a highly disaggregated model of the Tennessee Valley Authority service area in order to identify regional differences more clearly and to increase confidence in demand projections. Research on policy alternatives in coal mining is being given increased emphasis to understand the cost penalties incurred at various levels of land reclamation. The goal is to develop a quantitative picture of coal supply and demand to assess the impact of measures which would force an environmentally acceptable use of the coal resource. Measurements of trace element buildup in the environment surrounding a coal-fired steam plant have largely been completed. The analyses, and accompanying simulation modeling, fail to show any significant effect traceable to the presence of the steam plant. Work during the next 6 months will consist of improving the in-plant material balances, particularly for the volatile elements. (Author introduction modified)

45452 **APTIC NO. 69151**

Western Research and Development Ltd., Calgary (Alberta)

INVENTORY OF AIR POLLUTION SOURCES AND EMISSIONS IN THE CITY OF CALGARY, 1971 (FINAL REPORT). *Alberta Dept. of the Environment Contract, 71p., Jan. 1973. 1 ref.*

Data from an air pollution source and emission inventory (point and area sources) of the city of Calgary for 1971 are presented. The estimated total air pollutant emission from all sources in the city was 177,000 short tons in 1971, with approximately 97% of these being gaseous emissions. The greatest source of emissions was the gasoline-powered motor vehicle. Approximately 5500 short tons of sulfur dioxide were released during the year, with industrial sources contributing almost 90% of this quantity. Carbon monoxide emissions totalled 125,000 tons in 1971, with 97% coming from motor vehicles. Approximately 16,000 tons of nitrogen oxides were emitted. Motor vehicles were responsible for almost 70%, and industrial sources and natural gas combustion each contributed about 15% of the total. Gaseous hydrocarbon emissions totalled 25,500 tons, with the major contributor being motor vehicles (70%). The remaining fraction was largely due to evaporative losses of solvents and petroleum products. Approximately 4500 tons of particulates were emitted during the year, with industrial operations accounting for 60% of these.

1972

45453 **APTIC NO. 68562**

Baum, F. and W. Block

EMISSION CONTROL FOR OIL EVAPORATION BURNERS IN NORTHRINE WESTPHALIA. *(Auswurfbegrenzung fuer Oelverdampfungsbrenner in Nordrhein-Westfalen). Text in German. Schornsteinfegerhandwerk, 26(2):1-6, 1972. 16 refs.*

Results of test stand investigations of the soot emissions from oil evaporation burners with consumption rates ranging from 258 to 828 cu m/hr are presented. The chimney draft was varied between zero and 7 mm water columns. The soot formation, and consequently the soot number, was highest at the strongest pressure, especially at the weakest drafts, and lowest in the middle range of pressures, practically regardless of the oil consumption. A reduction of the draft pressure may cause, apart from an increase in the soot number, a reduction of the carbon dioxide concentration to 5-6%, and a corresponding increase in the carbon monoxide emission which can reach up to 4-5%. Flawless and properly maintained evaporation burners now available can operate without noteworthy soot and CO emissions. The limit value of the soot number should be set at 4.

45454 **APTIC NO. 68576**

Baum, F., J. Giebel, and V. Troll

PROCESSING OF SOOT EMISSION DATA ON OIL FIRINGS IN NORTHRHINE WESTPHALIA. *(Datenverarbeitung der Ergebnesse von Russemissionsmessungen an Oelfeuerungen im Lande Nordrhein-Westfalen). Text in German. Schornsteinfegerhandwerk, 26(3):1-6, 1972, 10 refs.*

The organizational procedure of boiler inspection and related data processing and evaluation as introduced in Northrhine Westphalia for the regular yearly inspection of oil-firing equipment with capacities ranging from 14,000 to 800,000 kcal/hr is described. The yearly inspection comprises determination of soot the carbon dioxide emission as well as the detection of oil in the flue gas. The soot number data collected are classed according to the soot numbers. The evaluation of the data collected for many years shows that the percentage of the objectionable units soot numbers over 4 has dropped sharply from over 60% in the 1964-1965 heating period to level out around the 13% mark in the 1970-1971 heating period, after which no further reduction can be expected without additional emission control measures. Certain burner and firing equipment models are chiefly responsible for the soot numbers over 4.

45455 **APTIC NO. 68370**

Beaton, J. L., A. J. Ranzieri, and J. B. Skog

AIR QUALITY MANUAL. VOL. II. MOTOR VEHICLE EMISSION FACTORS FOR ESTIMATES OF HIGHWAY IMPACT ON AIR QUALITY (INTERIM REPORT. JUNE 1971 THRU APRIL 1972). *California Dept. of Public Works, Sacramento, Div. of Highways, Federal Highway Administration Contract FH-11-7730, Work Unit FCP 33F3032, Rept. FHWA-RD-72-34, Rept. CA-HWY-MR6570825(2)-72-10, 67p., April 1972. 6 refs.*

Highway engineers must consider a variety of factors in the environmental impact of any highway project and complete a number of studies prior to writing an impact statement. One of these studies is concerned with the gathering of field data, analysis of such data, and writing an air quality report. An important part of that study is the use of emission factors which are most representative of vehicles using freeways, local roads, and streets. The emission factors take into account the vehicle deterioration factors, model year, annual mileage traveled, and average route speed. Emission factors are presented based on the best data currently available. Federal and California emission standards, the 1972 Federal test procedure, deterioration factor values for light and heavy duty vehicles, data for vehicle travel versus age, and emission factors for vehicles using city streets and freeways with different percentages of light and heavy duty vehicle traffic are described. Carbon monoxide, hydrocarbon, and nitrogen oxide emissions from exhaust, crankcase, and fuel evaporation sources are presented. (Author abstract modified)

45456 **APTIC NO. 68371**

Beaton, John L., Earl C. Shirley, and John B. Skog

AIR QUALITY MANUAL. VOL. III. TRAFFIC INFORMATION REQUIREMENTS FOR ESTIMATES OF HIGHWAY IMPACT ON AIR QUALITY (INTERIM REPORT. JUNE 1971 THRU APRIL 1972). *California Dept. of Public Works, Sacramento, Div. of Highways, Federal Highway Administration Contract FH-11-7730, Work Unit FCP 33F3032, Rept. FHWA-RD-72-35, Rept. CA-HWY-MR6570825(3)-72-09, 35p., April 1972. 11 refs.*

Highway engineers will have to consider a variety of factors in the environmental impact of any highway project and complete a number of studies prior to writing an impact statement. One of these studies is concerned with the gathering of field data, analysis of such data, and writing an air quality report. The reasoning behind the method of air quality analysis which includes a consideration of traffic information is described. An understanding is given of the relationship between the traffic parameters and the way in which air quality is affected. The traffic parameters discussed include vehicle operating mode, pollutant emissions, vehicle volumes, traffic network changes, traffic growth factors, and time framework. The minimum traffic estimate requirements are described. (Author abstract modified)

45457 **APTIC NO. 68373**

Beaton, J. L., E. C. Shirley, and J. B. Skog

AIR QUALITY MANUAL. VOL. VII. A METHOD OF ANALYZING AND REPORTING HIGHWAY IMPACT ON AIR QUALITY (INTERIM REPORT. JUNE 1971 THRU APRIL 1972). *California Dept. of Public Works, Sacramento, Div. of Highways, Federal Highway Administration Contract FH-11-7730, Work Unit FCP 33F3032, Rept. FHWA-RD-72-39, Rept. CA-HWY-MR6570825(6)-72-06, 35p., April 1972. 7 refs.*

Highway engineers will have to consider a variety of factors in the environmental impact of any highway project and complete a number of studies prior to writing an impact statement. One of these studies is concerned with the gathering of field data, analysis of such data, and writing an air quality report. The legal requirements for environmental studies, the air pollution phenomena, and air pollutants from vehicles are discussed. The component parts of an air quality study are discussed, including characterization of source strength, transport and dispersion of pollutants, mathematical analysis, and ambient air quality. The presentation of data, data summary, visual aids, aerometric data banks, and other aspects of air quality studies are also described. (Author abstract modified)

45458 **APTIC NO. 68564**

Della Casa, H., N. Jusseau, D. Borgnat, and B. Eyglunent

COMBUSTION TESTS OF HYDROCARBONS IN THE ABSENCE OF AIR WITH A VIEW TOWARD MASSIVE INJECTION BLAST FURNACES. *(Essais de combustion d hydrocarbures avec defaut d air en vue de leur injection massive dans les hauts fourneaux). Text in French. Centre Doc. Siderurg. Circ. Inform Tech., 29(11):2345-2373, 1972.*

Combustion tests of fuel oils and natural gas in air deficiency were carried out in a model blast furnace to examine the use of such fuels in place of the more expensive coke. Large amounts of fuel oil or natural gas could be injected through the injector originally used as a hot air injector for coke gasification without a temperature drop. The feed rate amounted to 155 g liquid fuel/cu m air, corresponding to an air-excess coefficient of 0.58. The gas formed is composed of carbon monoxide, carbon dioxide, hydrogen, and water vapor. The oxygen contained in the combustion air, CO2, and water reacts with the highly reactive coke to yield a gas composed practically entirely of CO and hydrogen for the reduction process. The unburned hydrocarbon and soot formation could be could be reduced substantially by shock-wave tubes for feeding the oil. The soot content in the reducing gas fell sharply as the shock wave intensified.

45459 **APTIC NO. 68418**

Freed, V. H., R. Haque, and D. Schmedding

VAPORIZATION AND ENVIRONMENTAL CONTAMINATION BY DDT. *Chemosphere, 1(2):61-66, March 1972. 19 refs.*

To assess the extent to which DDT may be contaminating the world ecosystem, it is necessary to consider the means by which the chemical might be transported. Aerial transport may account for DDT contamination of areas contiguous to where it is used. Pesticide contamination of the air can occur by aerosol spray or dust particles suspended during application, by subsequent wind erosion of contaminated soil, or by vaporization of the chemical from the treated areas. Vaporization has been calculated on a theoretical basis and by measurements above a field and above soil in a laboratory. The DDT loss as reported by Hartley and Lloyd-Jones on theoretical considerations is reasonable. The loss is comparatively high when the chemical evaporates from its own surface or from the surface of an inert material. When soil is introduced as a component part of the system, the rate of vaporization is substantially reduced, apparently to a maximum of tenths of a pound/acre at 30 C or 86 F. It is evident that the evaporative loss is strongly dependent on the nature of the soil, the temperature, and the moisture content. A sandy soil with few sites of adsorption will show greater loss, while a soil high in organic matter will show smaller losses. An increase in temperature accelerates the chemical loss. There is good agreement between theoretical evaporative losses and experimentally determined rates of loss when DDT is measured from its own or other relatively nonsorbing surfaces. Similarly, there is good agreement between calculated and determined evaporative losses from soil. Thus, aerial contamination by evaporative means would be a satisfactory factor only in areas near sites of treatment, and no satisfactory explanation exists for the presumed universal contamination of the world ecosphere. Erosion of contaminated soil by water or wind may be a more important factor in mobility than vaporization. (Author conclusions modified)

45460 **APTIC NO. 68800**

Grimbergen, M. Van and G. Reybrouck

CREATION OF AIR POLLUTION BY BURNING OF THERMOPLASTIC MATERIALS USED AS DISPOSABLE MATERIALS IN MEDICINE. *(Ontstaan van luchtkontaminanten door verbranding van thermoplastische stoffen aangewend als grondstof in medisch wegwerpmaterieel). Text in Flemish. Arch. Belg. Med. Soc., 30(2):90-101, 1972. 21 refs.*

The combustion process of polyethylene, polypropylene, polystyrene, and polyvinylchloride as contained in disposable medicinal supplies, and the air pollutants formed during incineration were studied in a laboratory type incinerator. Regarding the soot, tar and other emissions, the incineration of polyethylene and polypropylene can be regarded as harmless, while polystyrene and PVC should not be destroyed by incineration due to the formation of air pollutants. The optimum incineration temperatures were between 350 and 450 C for polyethylene, polypropylene, and polystyrene, and between 350 and 650 C for PVC. The flu gases generated during the incineration of PVC contained 734 to 1110 ppm hydrochloric acid. The flue gases from the incineration of styrene contained 430 ppm aromatic hydrocarbons expressed in styrene.

45461 APTIC NO. 68779

Hilliger, Hans Georg and Siegfried Matthes

HOW THE EMISSION OF DUST, GERMS, AND ODORS AFFECTS HUMANS AND ANIMALS. *(Wirkung von Staub-, Keim- und Geruchsimmissionen auf Mensch und Tier). Text in German. Ber. Ldw., 50(3):557-570, 1972. 200 refs.*

Dust, germ, and odor emissions in animal breeding facilities and their effects on the human and animal organisms are reviewed. The maximum allowable concentration of dust, originating from the animals, litter, fodder, and excrements, is limited to 10 mg/cu m in animal breeding facilities. The effect of the dust which is predominantly organic in its nature on the organism is modified by the humidity content of the air and the presence of germs. Affection of the respiratory organs, such as farmer s lung, is most common. The germ concentration in the air of animal breeding facilities is influenced by that in the litter, fodder, and excrements, as well as by the intensity of the ventilation, air humidity, temperature, and the animal species. Close correlation between the respirable dust and germ concentrations in the air was established. Airborne germs may cause rhinitis, tracheitis, bronchitis, conjunctivitis, headache, arthralgia, and hyperthermia. Germs, including pathogens, may be highly persistent in animal breeding facilities and their waste products. The typical odor of animal breeding facilities is due to a combination of a multitude of odorous substances, such as ammonia, hydrogen sulfide, alcohols, amides, amines, carbonyls, mercaptans, methane, and organic acids. Fecal matter is chiefly responsible for malodorous emissions. Compared with the nuisance involved, the health hazards of malodorous emissions in animal breeding facilities are of secondary importance.

45462 APTIC NO. 68807

Kaurov, P. I., U. K. Bakirov, and O. A. Bogayevskiy

VENTILATION OF ALUMINUM ELECTROLYSIS SHOPS. *(Provetrivaniye tsekhov elektroliza alyuminiya). Text in Russian. Bezop. Tr. Prom., no. 11:37-38, 1972.*

Problems of ventilation and air pollution control in aluminum electrolysis shops are described. In one electrolysis shop, the air discharged contains 2.1 mg fluorides, including 0.7 mg hydrofluoric acid per cu m. Ventilation due to the heat released by the electrolyzers is insufficient as it is controlled mostly by the wind with the aeration pressure not exceeding 0.5 mm of water column. Therefore, mechanical ventilation, especially exhaust ventilation, must be provided for along with conditioning of the incoming air and purification of the exhaust.

45463 APTIC NO. 68616

Zareski, Gordon K.

NATURAL GAS AVAILABILITY: PRESENT AND FUTURE. *Preprint, General Services Administration, Washington, D. C., 13p., 1972. 1 ref. (Presented at the Gaseous Fueled Vehicles and the Environment Symposium, Washington, D. C., May 24-26, 1972.)*

NTIS: N74-19587

Natural gas fuel availability will be a critical factor in the ability to use gas as a motor fuel. The 1969 U. S. consumption of motor gasoline was 85.4 billion gas, equivalent to 10.6 trillion cu ft of natural gas at 1032 Btu/cu ft, which is about 50% of the total gas consumed in 1969. Between 1950 and 1970 the demand for gas increased by more than 6% annually. Historical trends in natural gas production and reserves show that since 1968, production has exceeded reserve additions. The current level of reserves equals 247.4 trillion cu ft. The reserve to production ratio has declined steadily from 26.8 in 1950 to 11.3 in 1971. During the same period, the findings to production ratio declined from 1.7 to 0.4. Since 1956, the number of wells drilled annually has decreased. It is estimated that domestic production will peak at less than 25 trillion cu ft annually in the 1973-1974 period and then decline and stabilize at a somewhat lower level in the 1980s. Even if reserve development is estimated at high rates of 20, 25 or 30 trillion cu ft, demand will surpass supply and continue to do so from the mid 1970s onward. Supplementary sources of natural gas will be important in the future, such as the Alaska pipeline which could transport 2.3 trillion cu ft/yr by 1990. Advancement in liquefied natural gas handling techniques will aid importation of natural gas. Synthetic pipeline quality gas from coal represents another source, however gasification of coal represents formidable problems. The first commercial gasification is expected by 1976. By 1990, 3.3 trillion cu ft of natural gas could be produced by this source. Supplemental sources of natural gas will not completely satisfy annual demands, however. Since demand predictions do not project the use of gas as a motor fuel, it is likely that use of gas as a vehicular fuel must be based on a consideration of critical supply deficits which are developing.

1971

45464 APTIC NO. 68918

Gorshunova, A. I. and E. I. Chukho

STUDY OF THE GAS EMANATION OF A NUMBER OF POLYMERS DURING THEIR PROLONGED STORAGE. *In: Current problems in Space Biology and Medicine. (Aktualnyye voprosy kosmicheskoy biologii i meditsiny). p. 98-93, 1971. Translated from Russian. Joint Publications Research Service, Arlington, Va., p. 33-39, July 14, 1972.*

NTIS: JPRS 56499

Polymers used in construction materials such as those for a spaceship cabin can release different toxic substances into the atmosphere. The change in the qualitative and quantitative composition of volatile gaseous products escaping into the surrounding medium from polymers during their prolonged retention under natural conditions was studied. The materials tested were siloxane rubber, fluoroplastic glue, enamel based on epoxy and polyamide resin, glass plastic based on phenol- formaldehyde resin, rubber, putty based on epoxy resin, glue based on chloroprene rubber, foam polystyrene based construction panels, and a glass plastic-gluey composition based on epoxy resin. Film materials and a number of dense materials emitted gases on an exponential basis with the time the samples were kept.

45465 APTIC NO. 68664

Murata, Motohide

BAD ODOR PROBLEMS IN THE PETROLEUM INDUSTRIAL COMPLEX AREAS - THE CASE OF YOKKAICHI. *(Sekiyu konbinato chiiki ni okeru akushu mondai). Text in Japanese. Akushu no Kenkyu (Odor Research J. Japan), 4(16):9-18, Aug. 1971. 26 refs.*

The complaints of Yokkaichi citizens against bad odor from the petroleum industrial complex constitutes about 60% of the total complaints against all forms of pollution. Of the total complaints registered in 1972 (2063), 1002 (48.6%) were against bad odor. The average ratio of complaints against bad odor for all of Japan is 24.6% of all types of pollution complaints. Generally, the sources of these bad odors are mercaptans, sulfides, various hydrocarbons, chlorine, and hydrogen chloride, and they are largely divided into two main groups of hydrocarbons and impurities such as sulfur and nitrogen contained in oil. In the vicinity of a Yokkaichi plant the levels of averages and maximums were: for hydrocarbons, 0.45 and 7 ppm; for aldehydes, 0.17 and 7 ppm; for ketones, 0.09 and 7 ppm, for alcohol, 0.05 and 2.4 ppm, and for aromatic HCs, trace levels and 0.16 ppm. In the plants themselves, acetoaldehyde, butylaldehyde (isobutylaldehyde, n-butylaldehyde), low class olefins, styrenes, propylene, 1,3 butadiene, vinyl chloride, dimethyl ether, ethyl alcohol, propane, and other elements are detected. According to a 1973 investigation on the borderlines of factories (21 locations) for HCs, 23 elements of aliphatic HCs, and six elements of aromatic HCs were detected. But while the total average of aromatic HC ratio was 20%, it was close to 70% depending on the measurement locations. Composite odors showed much more intense effects than single substance odors.

45466 **APTIC NO. 68383**

Shaw, W. C., H. E. Heggestad, and W. W. Heck

POLLUTION POSES THREAT TO MAN, FARMS, NATURE. *In: Yearb. Agric., 1971:293-299, 1971.*

The threat of pollution to man, agricultural production, and the earth s ecosystem is reviewed. Two types of pollutants are of concern: those created by man (industrial chemicals and radioactive substances) and natural materials in unnatural concentrations (dust, plant nutrients, mercury, lead, and organic wastes). Primary pollutant emissions from nonagricultural sources are estimated to total more than 200 million tons each year. These pollutants include: carbon monoxide, sulfur oxides, hydrocarbons, nitrogen oxides, and particulates. Secondary pollutants such as ozone and peroxyacyl nitrates which participate in photochemical reactions are capable of causing serious injury to large acreages of forests and agricultural crops when they occur in relatively uniform distribution over extensive regions. Air pollutants from agricultural practices include: infectious microorganisms, pollens and other allergens, pesticides, and combustion products from the burning of forest and crop residues. Natural dust from industrial and agricultural operations is emitted into the atmosphere of the United States at an estimated rate of 30 million tons/yr. Allergies from weed pollens result in an estimated 12.5 million cases of asthma, hayfever, or both each year. Atmospheric pollution also results in soil pollution since soil is a major sink for residues coupled to the atmosphere.

1968

45467 **APTIC NO. 68570**

Kay, Kingsley

A LOOK AT THE FUTURE OF HAZARDOUS CONTAMINATION OF THE CIRCUMPOLAR ENVIRONMENT. *Arch Environ Health, vol. 17:653-661, Oct. 1968. 52 refs. (Presented at the Symposium on Circumpolar Health Related Problems, University of Alaska, College, July 28, 1967.)*

Current and potential contamination of the circumpolar environment by mining and mineral processing operations in reviewed in terms of biological, chemical, and radionuclide wastes. Biological wastes in the form of bacterial, viral, and zoonotic entities are capable of contaminating the permafrost, as evidenced by the recovery of viable bacteria present in permafrost. Chemical wastes, particularly arsenic compounds discharged into the air from mineral processing operations, pose a particular hazard in view of the arctic meteorological conditions which favor temperature inversion and low air movement. Arsenic water level increases of from 0.01-0.25 ppm are cited for industrial areas. Domestic preparations such as carbon tetrachloride and benzene also pose hazards under the poor ventilating conditions of arctic housing. Odorous emissions containing aldehydes and higher aliphatic alcohols are cited in connection with petrochemical operations. Sulfur dioxide is given off in appreciable quantities in gold ore roasting in the Arctic. Pesticides also contaminate the Arctic, owing to air spraying of insecticides to control the prolific summer insect population of the Arctic. Radionuclide wastes in the Arctic result from mining and smelting operations and meteorological distribution of wastes from other parts of the globe.

1954

45468 **APTIC NO. 68330**

Reed, Ernest

ODOR PROBLEMS IN THE PAPER INDUSTRY. *Ann. N. Y. Acad. Sci., 58(2):34-36, March 1954.*

The paper industry has odor problems, some of which can be very serious and costly. Odor flare-ups occur sporadically and usually are unanticipated. Some species of wood may cause more odors than other woods because of their odor constituents. The ground wood and water can form a perfect culture for many microorganisms, some of which cause odor. Inks, dyes, and waxing materials can also cause odors. Re-run paper increases the probability of odor formation. The problem of odor detection and identification also occurs in the paper industry.

1941

45469 **APTIC NO. 68361**

Martin, A.

LUBRICATING OILS. *National School of Internal Combustion Engines, Conf. Mfr. Use Replacement Fuels Lubr., p. 119-198, 1941. (Paper 9.) Translated from French, 80p.*

Lubricating oils for use in the automobile engine are discussed. Perfect lubrication requires an oil whose viscosity varies as little as possible with temperature. A paraffinic oil that has not been overtreated provides good resistance to alteration in the crankcase. An oil that exhibits a certain degree of naphthenic characteristics prevents the formation of too much calamine and keeps certain oxidation products in solution. Castor oil and olive are possible substitutes for mineral oil. Castor oil is very acid, can cause corrosion, and when burned has an unpleasant odor. Olive oil is less drying than castor oil, and will not cause gumming. It is particularly useful in high speed diesel engines. Problems associated with reclaiming motor oil are discussed, including treatment of these impurities: siliceous impurities, metal particles, impurities from fuel mixtures, and products of incomplete combustion.

CONTROL METHODS

1974

45470 **APTIC NO. 68656**

Abel, W. T., F. G. Shultz, and P. F. Langdon

REMOVAL OF HYDROGEN SULFIDE FROM HOT PRODUCER GAS BY SOLID ABSORBENTS. *Bureau of Mines, Morgantown, W. Va., Morgantown Energy Research Center, RI 7947, 28p., 1974. 11 refs.*

Forty-eight materials were tested for their ability to absorb hydrogen sulfide from hot simulated producer gas (1000-1500 F). The best material from the standpoint of absorption capacity, durability, and amenability to regeneration was sintered pellets of 75% fly ash-25% ferric oxide. The performance of this absorbent under simulated and actual conditions is described. The effects of absorbent composition; absorbent temperature, steam content of the gas, and tar vapors and dust in producer gas are discussed. The pellets are easily formed by extruding or forming from a thick water paste of the fine-size ingredients and sintering at furnace temperature of 1900-2000 F for 10-15 min. Regeneration is conveniently accomplished by regeneration in air or oxygen, yielding a concentrated stream of sulfur dioxide from O2 regeneration. Temperatures above 1500 F in either absorption or regeneration will cause damage to the pellets by fusing the surface with resulting loss of porosity and ending its useful life. The absorbent removed over 95% of the H2S from producer gas at extended periods at temperatures of 1100-1300 F and gas space velocities of 500-1000 F. Absorption capacities ranged from 4 g of sulfur at 1100 F to over 6 g/100 g of absorbent at 1300 F in producer gas containing 10% steam and 1 lb of tar and 1/2 of dust/1000 scf. Assuming complete reaction of the 25 g of Fe2O3 in 100 g of absorbent, the maximum S absorption capacity is 15.1 g of S/100 g of absorbent. This value was approached in dry- simulated producer gas at 1500 F during long-term testing of the absorbent. The addition of 7% steam reduced the capacity appreciably. Long-term testing of the absorbent in simulated producer gas demonstrated the durability of the absorbent. (Author conclusions modified)

45471 **APTIC NO. 68999**

Akiyama, Yoshio, Tadanori Sato, and Hitoshi Koyama

PURIFICATION METHOD FOR EXHAUST GASES FROM A TWO-CYCLE GASOLINE JET ENGINE. *(2-Saikuru gasorin fuusha enjin no haiki gasu joka hoshiki). Text in Japanese. (Fuji Heavy Industries, Tokyo (Japan)) Japan. Pat. Sho 49-28841. 5p., July 30, 1974. 2 refs. (Appl. Nov. 14, 1969, 1 claim).*

By modification of the 2-cycle gasoline jet engine, it is possible to lower the hydrocarbon emission concentration to 1/10, and the carbon monoxide emission level to 1/2 of the respective emissions from the usual carburetor-type engine. It is not necessary to add special purification equipment, and the engine capacity is not lowered a great deal. An automatic jet valve is attached to the cylinder head, so that fuel is injected at an angle in a direction opposite to air flow toward the cylinder head. The jet pump is constructed to shut off the fuel completely during high-speed, low load conditions. The jet pump is also interlocked with the throttle valve, accelerator pedal, and ignition timer. The throttle valve does not close beyond a certain point, and at this juncture, the ignition time is dependent on the accelerator. Power output can then be controlled independently of the throttle valve opening. Since air and fuel intake are independent of each other in a gasoline jet engine, more complete fuel combustion can be attained in the exhaust tube by adjusting air intake. Smooth engine operation is possible at the same time.

45472 **APTIC NO. 69147**

Allsup, J. R. and R. D. Fleming

EMISSION CHARACTERISTICS OF A PRIME MOVER FOR HYBRID VEHICLE USE. *Bureau of Mines, Bartlesville, Okla., Bartlesville Energy Research Center, RI 7988, 36p., 1974. 5 refs.*

GPO

A conventional spark-ignition engine was studied as a prime mover for use in a hybrid system. The study involved both steady-state and transient engine operation with ignition timing, air-fuel ratio, exhaust gas recirculation, oxidizing type catalytic converters, engine speed, and power output as variables. Data were obtained from two 1971 model 350 cu in. displacement engines mounted on engine dynamometer stands. When the hybrid engine was operated with an oxidizing catalyst at power output levels required for a 4000-pound curb weight hybrid vehicle, carbon monoxide and hydrocarbon emissions could be reduced to approximately 2.0 g and 0.3 g per brake hp-hr, respectively. With exhaust gas recirculation, oxides of nitrogen emission levels could be reduced to approximately 1.2 g per brake hp-hr. Without a catalyst minimum CO levels were 5-7 g/bhp-hr and minimum HC levels were 0.3-0.5 g/bhp-hr. (Author abstract modified)

45473 **APTIC NO. 68867**

Altenkirch, R. A. and A. M. Mellor

EMISSIONS AND PERFORMANCE OF GAS TURBINE LINERS. II: INTERNAL SPECIES CONCENTRATIONS (FINAL REPORT). *Purdue Univ., West Lafayette, Ind., Combustion Lab., General Motors Corp. Detroit Diesel Allison Div. Purchase Order H240959, Rept. PURDU-CL-74-03, 61p., Aug. 1974. 12 refs.*

A current trend in low emission continuous flow combustors is the vaporizing of the fuel and mixing it with the air before the combustion process is allowed to proceed. A prevaporizing combustor consisting of a vaporization section upstream of a bluff body flameholder, with secondary air addition downstream of the recirculation zone established by the bluff body, was tested experimentally. Detailed profiles of oxides of nitrogen, carbon monoxide, and unburned hydrocarbons were obtained. From these concentration measurements, a physical model of the processes occurring in the combustion chamber was developed. The model can be used to study the phenomena occurring within the combustion chamber and to predict the emissions and performance of a combustor design before experimentation is carried out. (Author abstract modified)

45474 **APTIC NO. 69051**

Ando, Junpei

THE STATUS QUO AND TREND OF EXHAUST GAS DESULFURIZATION IN EUROPE AND AMERICA. *(Ou-bei ni okeru haien datsuryu no genjo to doko). Text in Japanese. Sekko to Sekkai (Gypsum Lime), no. 130:116-123, May 1974. 5 refs.*

Exhaust gas desulfurization in the U.S.A. is chiefly by the Wet Limestone Method in which by-products are recovered. The Babcock and Wilcox method of Commonwealth Edison Co. is the most successful version. A two-stage perforated plate is employed in the scrubber and the rate of sulfur withdrawal is 75 to 85%. Problems include stoppage of the demister resulting from scaling, corrosion of the heat exchanger employed in heating exhaust gas, and treatment of sludge as a by-product. By-products of the Wet Limestone Method consists of 80% sulfurous lime, 10% fly ash and 10% gypsum in ordinary plants which utilize electric dust precipitators, while fly ash is produced in larger quantity than sulfurous lime in plants in which electric dust precipitators are not utilized. The Wet Limestone method introduces sludge into a precipitator cistern so that the solution in the upper part can be employed again. This practice must be revised. Major factories in the U.S.A. which utilize the sulfur dioxide withdrawal method are presented. Sulfur is the most promising by-product of this method. Major factories in Europe which utilize exhaust gas desulfurization are presented.

45475 **APTIC NO. 68960**

Ando, Naohiko

PROPERTIES AND UTILIZATION OF GYPSUM FROM EXHAUST GAS DESULFURIZATION. *(Haien datsuryu sekko no tokusei to riyo). Text in Japanese. Sekko to Sekkai (Gypsum Lime), no. 131:164- 168, 1974.*

Gypsum produced in exhaust gas desulfurization is of good enough quality to be used as a raw material for gypsum board and gypsum plaster but lacks the tensile strength and compression needed for other industrial purposes. In some cases there exist differences in the quality of gypsum produced depending upon operating conditions. Recent changes in gypsum consumption in Japan are described and compared with those in the U. S., which is advanced in terms of gypsum industry. In the U. S. there has been a small decrease in gypsum cement consumption and a large decrease in gypsum plaster consumption. Gypsum board consumption doubled in 6 yr. In Japan, cement gypsum, gypsum plaster and gypsum board consumptions all doubled in 6 yr. The absolute consumption of the U. S. is four times as large as that of Japan. Also, there is a big difference between the U. S. and Japan in the ratio of gypsum cement to plaster of Paris. The same thing can be said of Western Europe which is also advanced in terms of its gypsum industry. Western Europe is different from the U. S. in that gypsum plaster is still of high weight. Gypsum consumption per capita in Western Europe and the U. S. is 70 kg, which is twice as large as that of Japan.

45476 APTIC NO. 68344

Andrews, E. J. and B. Kouzel

BEAVON SULFUR REMOVAL PROCESS ELIMINATES SULFUR IN CLAUS PLANT TAIL GAS. *Preprint, Gas Processors Assoc., Tulsa, Okla. (?), 3p., 1974. 1 ref. (Presented at the Gas Processors Association, Annual Convention, 53rd, Denver, Colo., March 25-27, 1974.)*

The Beavon Sulfur Removal Process designed for the elimination of sulfur dioxide from Claus plant tail gas is described along with its successful installation and operation at a refinery of the Union Oil Company of California. The process converts essentially all of the sulfur compounds in Claus plant tail gas to high quality elemental sulfur and produces a treated gas containing below 100 ppmv of SO2 equivalent. The process consists of two main operation sections: the hydrogenation/hydrolysis reactor where all forms of sulfur in the tail gas are converted to hydrogen sulfide in the presence of hydrogen and the Stretford section which makes use of a commercially proven wet chemical process to convert H2S to high purity elemental sulfur. Installation of two 5LT/D BSRP units, each fed by a 100 LT/D Claus 3-stage sulfur plant, indicate successful operation of the Beavon process with the exception of initial problems with rotary vacuum sulfur filters (due to oversizing) and occasional plugging in the line carrying the sulfur slurry from the filter to the sulfur melter. The latter difficulty is solved by minor modifications to the system.

45477 APTIC NO. 69161

Archer, D. H., D. Berg, and E. V. Somers

FLUIDIZED BED GASIFICATION AND COMBUSTION FOR POWER GENERATION. *Preprint, 26p., 1974. 22 refs. (Presented at the World Energy Conference/Conference Mondiale de l energie, Detroit, Mich., 1974, Paper 4.1-17.)*

An experimental program in the development of fluidized bed gasification and combustion for power generation is described. The chemical reactions and processes involved in the fluidized gasification of coal to remove sulfur compounds and in fluidized bed combustion are reviewed. Fluidized bed combustion and gasification at elevated pressure using present gas and steam turbine technology have the potential to meet abatement goals for sulfur dioxide, nitrogen oxides, and particulate emissions at an energy generating cost 10% less than that for a conventional pulverized coal plant with stack gas scrubbing. Plant efficiencies of 38 to 40% can be achieved with current power generation technology. Estimated costs between pressurized combustion and gasification plants appear comparable. Regeneration and recycle of the limestone/dolomite sorbent will probably be required for effective operation of fluidized bed power plants to avoid solid waste disposal problems. Second generation fluidized bed fuel processing plants may reach 50% for gasification and 45% for fluidized bed combustion. (Author conclusions modified)

45478 APTIC NO. 68276

Armstrong, M. J. and P. S. Patel

RANKINE CYCLE POWER SYSTEMS WITH ORGANIC BASED WORKING FLUID FOR AUTOMOTIVE SYSTEMS. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 23.1-23.11. (Nov. 4-8, Paper 23.)*

Rankine cycle power systems with organic working fluids are described for automobile propulsion and for application as a bottoming cycle operating on waste exhaust energy from heavy duty diesel engines. The Rankine cycle automobile engine is a completely sealed system consisting of a burner-boiler, expander, feedpump, condenser, and regenerator. Organic vapor from the boiler is expanded in a reciprocating expander to produce the power to drive the vehicle. The working fluid used is Fluorinol-85, a mixture of 85 mole% trifluoroethanol and 15 mole% water. Steady-state emission measurements used as input to a computer program to project emission levels over the federal driving cycle used by the Environmental Protection Agency show pollution levels well below the 1977 American standards: 0.17 g/mi unburned hydrocarbons, 0.21 g/mi carbon monoxide, and 0.275 g/mi nitrogen oxides. A diesel-organic Rankine combined cycle power plant for heavy duty trucks which results in a 15% improvement in fuel economy and emissions over a wide load range is also being tested. The working fluid is Fluorinol-50. Emission levels are reduced by an amount at least equal to the gains in efficiency. A further advantage of the combined cycle system is that no modifications to the basic diesel engine are required.

45479 APTIC NO. 69043

Arrandale, Roy S.

POLLUTION CONTROL IN FUEL-FIRED TANKS PART 2. *Glass Ind., 55(9):16-17, 27 Sept. 1974 8 refs.*

In the case of soda-lime glass, a conventional fuel-fired furnace can be made to fall within air pollution control limits by having the volatile constituents, sulfates, boron, selenium, arsenic trioxide, nitrates, and fluorine, cut to the bare minimum feasible. This is especially imperative for the sulfates, since sulfates comprise 3/4 of the effluent material. Thus, the fining agents and oxidizers of flint glass especially, have to be held closer to the borderline of off-color glass and seedy glass in order to pass air pollution control limits. Some substitute components which produce less pollution do not exist, however. The average composition of particulate plus condensible material in stack gas is given for amber and flint container furnaces. The presence of barium oxide in the residue is a mystery. In some furnaces the residue contains none, even though barium is a constituent; in others as much as 1%. Magnesia never comes out in dolomitic ratio, indicating that there is not much lime dust. It also seems to make no difference in calcia in the stack gas whether one limestone is twice as decrepitating as another. The furnace checker is an effective dust collector by itself. Boron is very predictable, with a flat loss of about 10%. Sulfur trioxide loss from amber runs up to about 85% compared to 45% from flint. In a test of emissions from flint and amber furnaces, the geometric mean particle diameter was 0.13 mm and 0.11 mm, respectively. Sulfur trioxide concentrations were 17-15 ppm for both; sulfur dioxide concentrations were 250 and 315, respectively; and nitrogen oxides were 340 and 640 ppm, respectively.

45480 APTIC NO. 68339

Ashmead, D. R., J. S. Campbell, P. Davies, and K. Farmery

NITROGEN OXIDE REMOVAL CATALYSTS FOR PURIFICATION OF AUTOMOBILE EXHAUST GASES. *Society of Automotive Engineers, Inc., New York, 10p., 1974. 9 refs. (Presented at the Society of Automotive Engineers. Automotive Engineering Congress, Detroit, Mich., Feb. 25-March 1, 1974, Paper 740249.)*

The chemistry involved in the selective catalytic reduction of nitrogen oxides in automobile exhaust is outlined, and the requirements of a practical NOx reduction catalyst are summarized. Critical reactions for the removal of NOx are likely to be hydrogenation (with a mechanism proceeding through ammonia or some other NHn species) and/or the oxidation of carbon monoxide with the intermediary of surface N species or even isocyanates. Laboratory studies of NOx reduction catalysts indicate the following: ruthenium is the most effective catalytic material at high values of the reducing power index of the gas mixture (i.e., high CO or low O2 levels); rhodium is most effective over a narrow range of the reducing power index and can operate closer to stoichiometric than the other active species tested; base metal catalysts behave like Ru catalysts but require higher temperatures of operation; and platinum alone is relatively ineffective whatever the conditions of use. Limited endurance data obtained from dynamometer tests indicate it is possible to control hydrocarbons, CO, and NOx emissions simultaneously within the old 1976 limits for at least 10,000 mi on small displacement vehicles using a dual-catalyst system.

45481 APTIC NO. 68838

Bakke, Even

THE APPLICATION OF WET ELECTROSTATIC PRECIPITATORS FOR SOLID PARTICULATES, ORGANIC CONDENSABLES, AND GASEOUS EMISSION CONTROL. *Louisville Univ., Speed Scientific School, Ky.; International Assoc. for Pollution Control; American Chemical Society, Washington, D. C.; American Inst. of Chemical Engineers, New York; American Inst. of Industrial Engineers, New York; American Society of Civil Engineers, New York; American Society of Mechanical Engineers, New York; American Water Works Assoc., New York; Inst. of Electrical and Electronic Engineers, New York; and Water Pollution Control Assoc., Environ. Eng. Sci. Conf., Annu. Meet., Louisville, Ky., 1974, p. 275-294. 6 refs. (March 4-5.)*

Wet electrostatic precipitators can be used to remove organic condensables with very low energy consumption. They can also be used to remove particulates and gases. The recent development of a continuously sprayed, parallel plate, frame electrode, and horizontal flow design is a realistic alternative to high energy scrubbers. The theory of operation, design, applications, performance, limitations of the method for performance prediction, power consumption, and economics for wet electrostatic precipitators are discussed. Because of continual washing and cleaning of the collection plates, buildup of dust on the electrodes is virtually nonexistent, rapping is not required, and rapping loss is nonexistent. The dielectric constant of the particulate material and its size are the two most important particle parameters. The wet electrostatic precipitator has been used with a high degree of success on applications where the solid particles are of sub-micron size and where condensable organic droplets of submicron size have to be removed. The wet precipitator can also be applied in competition with dry precipitators on dusts with very high or very low dust resistivities. In a three field wet precipitator, removal efficiencies higher than 99.5% on solid particulates with 80% (by weight) less than 1 micron size have been measured consistently. Removal efficiencies of 95% and higher have been measured on tar mists. For a given liquid to gas ratio, the precipitator gives higher gaseous removal efficiencies than conventional countercurrent scrubbers. The Deutsch-Anderson equation for sizing the wet precipitators can only be used over a relatively small range of operating parameters. When operating with three electrically independent fields, the removal efficiency seems not to be influenced by a significant reduction in mean particle size of the incoming solid particulates. (Author conclusions modified)

45482 APTIC NO. 69896

Berger, Jerry E.

DESULFURIZATION OF GASOLINE. *Preprint, National Inst. of Health, Research Triangle Park, N. C., National Inst. of Environmental Health Sciences and Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Development, 31p., 1974. 11 refs. (Presented at the Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Durham, N. C., April 16-19, 1974.)*

Although gasoline blending streams exhibit widely varying sulfur concentrations, significant quantities of low-sulfur motor gasoline cannot be manufactured by reallocation of existing components without substantial sacrifices in the useful properties of the remaining fuels having normal sulfur levels. To meet the anticipated demand for low-sulfur unleaded gasoline which may be required for catalyst-equipped automobiles it will be necessary to install process equipment based on known hydro-treating technology. The effects which this construction program would exert on the activities, abilities, and needs of one petroleum refiner are sketched for two degrees of sulfur removal. The impacts of installing the process facilities which would be necessary are discussed in terms of time requirements, capital needs, and added energy expenditures. The anticipated demand for unleaded gasoline is such that additional desulfurization capacity may be required by 1978. For Shell Oil, capital investments of $70 million or $175 million would be required to produce sufficient gasoline in 1978 having 100 ppm or 50 ppm sulfur contents, respectively. The additional hydrotreating and related required processing will impose an additional energy need. The gasoline pool volume would shrink somewhat if crude intake is unaltered. (Author abstract modified)

45483 APTIC NO. 68267

Bertodo, R., T. W. E. Downes, I. D. Middlemiss, and F. Brear

DEVELOPMENT OF THE PERKINS SQUISH LIP COMBUSTION SYSTEM. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 14.1-14.21. 14 refs. (Nov. 4-8, Paper 14.)*

The Perkins Squish Lip Combustion System for small naturally aspirated direct injection diesel engines is described along with emissions data obtained from bench and field trials. The combustion system combines high air/fuel mixing rates with fast diffusion burning. The high mixing rates benefit smoke control, while a more evenly distributed equivalent ratio in both time and space assists nitrogen oxide suppression. The system is up to 7% more efficient than standard direct injection engines, and the combined NOx and hydrocarbon levels on the CARB 13-mode cycle are around 7.5-8 g/bhp h. The lugging smoke level does not exceed 7.5%. Retarding the timing to 3 degrees from top dead center degrades the thermal efficiency to a level comparable with that of conventional high swirl direct injection engines but reduces the emission levels on the 13-mode cycle below 5 g/bhp h at opacity levels of 5% at peak torque.

45484 APTIC NO. 68720

Beychok, Milton R.

COPING WITH SO2. *Chem. Eng. Deskbook, 81(22):79-85, Oct. 21, 1974. 36 refs.*

Successful commercial applications for removing sulfur dioxide from stack gas are discussed. Stack gas SO2 removal units are operating in 42 commercial applications, using 13 versions of seven basic processes. They are sodium sulfite scrubbing with thermal regeneration; lime slurry scrubbing; dual media system using dilute sulfuric acid for scrubbing; double alkali systems; copper oxide acceptor; activated carbon; and soda ash solution, once through without regeneration. The operating units range in size from less than 5 to as large as 250 megawatts (MW). Most of these are in Japan and many have operated from 2 yr or longer with onstream reliabilities of over 95%, while achieving SO2 removals of 95% or better. At least six commercial units are in operation in the United States, two of which are in large utility power plants. Others are in startup or under construction. (Author abstract modified)

45485 APTIC NO. 68258

Binder, K., E. Eisele, and K. Drexl

FUEL ATOMIZATION. *(Kraftstoffvernebelung). Text in German. Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. A 5.2.1-A 5.2.22. (Nov. 4-8, Paper A 5.2.)*

A gas/diesel-oil hybrid system investigated under conditions of simulating pre-fumigation/firing jet operation illustrates the possibility of reducing soot emission from direct injection diesel engines. Improvements in carbon monoxide, hydrocarbon, and nitrogen oxide emissions can also be attained with more elaborate control arrangements, though fuel consumption is increased. Initial experiments with fumigated diesel fuel indicate that this type of hybrid system obeys laws which differ from those governing conventional gas/diesel hybrid systems.

45486 **APTIC NO. 68822**

Blazowski, William S. and Gerald E. Bresowar

PRELIMINARY STUDY OF THE CATALYTIC COMBUSTOR CONCEPT AS APPLIED TO AIRCRAFT GAS TURBINES. *Air Force Aero Propulsion Lab., Wright-Patterson Air Force Base, Ohio, Proj. 3048, Task 304805, AFAPL-TR-74-32, 24p., May 1974. 13 refs.*

NTIS, DDC: AD 718762

A catalytic combustor operating at low-equivalence ratios throughout was evaluated in terms of combustion efficiency and exhaust emissions using JP-4-fueled aircraft gas turbines. Measured nitrogen oxide concentrations were below 2 ppm (two orders of magnitude below that expected from conventional combustors) for all operating conditions tested. A definite trend of increasing NOx levels was noted for increasing exhaust temperatures, though the levels were still below the 2 ppm concentration. Virtually 100% combustion efficiency was obtained at combustor inlet temperatures above 700 F and fuel-air ratios above 0.02. Specific heat release rates of 3.5 million BTU/atm-hr-cu ft were achieved with high efficiency. Catalytic bed pressure drops were about 1% of the combustor static pressure at 44 ft/sec reference velocity and 2400 F exhaust temperature. Carbon monoxide and hydrocarbon emissions sharply increased at fuel-air ratios less than 0.0212 or exhaust temperatures less than 2000 F.

45487 **APTIC NO. 68713**

Bolton, Robert A.

EXHAUST GAS RECIRCULATION. *(General Motors Corp., Detroit, Mich.) U. S. Pat. 3,799,131. 15p., March 26, 1974. 6 refs. (Appl. April 19, 1972, 20 claims).*

An exhaust gas recirculation method for reducing nitrogen oxide emissions from internal combustion engines is described which utilizes the exhaust back pressure to recirculate exhaust gases at a rate proportional to air flow and in a manner by which recirculation of the exhaust gases through the carburetor is avoided. An exhaust gas recirculation passage is provided which extends from the engine exhaust passage to the engine air reduction passage at a point downstream of the engine throttle. An orifice is provided in the recirculation passage, and a valve disposed downstream of the orifice is operated to create a zone of substantially constant pressure the passage irrespective of the wide variations in exhaust back pressure and induction passage vacuum. The pressure in the zone may be maintained either above or below atmospheric pressure, and the rate of flow of exhaust gases into and through the zone will be proportional to the rate of induction air flow. (Author summary modified)

45488 **APTIC NO. 68846**

Boscak, Vladimir and Jag Tandon

DEVELOPMENT OF CHEMICAL FOR SUPPRESSION OF COAL DUST DISPERSION FROM STORAGE PILES. *Louisville Univ., Speed Scientific School, Ky.; International Assoc. for Pollution Control; American Chemical Society, Washington, D. C.; American Inst. of Chemical Engineers, New York; American Inst. of Industrial Engineers, New York; American Society of Civil Engineers, New York; American Society of Mechanical Engineers, New York; American Water Works Assoc., New York; Inst. of Electrical and Electronic Engineers, New York; and Water Pollution Control Assoc., Environ. Eng. Sci. Conf., Annu. Meet., Louisville, Ky., 1974, p. 719-735. 13 refs. (March 4-5.)*

Coal dust dispersion from power plant storage piles presents a serious air pollution problem. A study was undertaken to analyze the problem and to develop a chemical for suppression of the coal dust dispersion. The factors influencing coal dust dispersion and the effectiveness of different chemicals in dust suppression were studied in a wind tunnel. The chemicals evaluated were from the following categories: stone dusts, wetting agents, hygroscopic salts, organic binders, and rendering products. No single chemical satisfied all the criteria set for an acceptable dust suppression chemical. The best results in coal dust suppression were achieved when a combination of several chemicals was used. An economic analysis showed that this combination is more economical than some commercially available dust suppressing chemicals and has some other advantages. The effectiveness of dust suppression chemicals was confirmed by an in-field test at a power plant site. A mathematical model for coal dust dispersion in a wind tunnel was developed during the study. (Author summary)

45489 **APTIC NO. 68749**

Bouscaren, R.

THE PREVENTION OF NITROGEN OXIDE EMISSIONS BY STATIONARY COMBUSTION EQUIPMENT. *(La prevention des emissions d oxydes d azote par les combustions dans les foyers fixes). Text in French. C.I.T.E.P.A. (Technical Interprofessional Study Center for Air Pollution), Etudes Documentaires. 42, CI809, 7p., 1974. 1 ref.*

Conditions of the formation and possibilities of the prevention of nitrogen oxides formation in stationary combustion equipment are reviewed. Nitric oxide, oxidized later to nitrogen dioxide, is formed in combustion processes from both air and fuel oxygen at high temperature and in the presence of an abundant quantity of oxygen. The nitrogen oxides formation increases with the size and load of the combustion equipment, and can be reduced by flue gas recirculation at rates not higher than 30%. Axial burners generate more nitrogen oxides than tangential and inclined burners do, and premixing burners also tend to reduce the NOx formation. Two-stage combustion, with 80% oxygen in the first stage, 35-40% oxygen in a second stage, and fluidized-bed combustion equipement have a similar effect by eliminating zones of peak temperature. Reduction of the air-excess coefficient, preheating of the combustion air, and water injection are also effective. Catalytic or thermal reduction results in the formation of unburnt products, and absorption in different solutions yields reaction products to be disposed of.

45490 **APTIC NO. 68786**

Bragg, J. R.

A COMPUTER MODEL OF THE MODIFIED CLAUS SULFUR RECOVERY PROCESS. *Preprint, American Inst. of Chemical Engineers, New York, 29p., 1974. 17 refs. (Presented at the American Institute of Chemical Engineers, Annual National Meeting, 76th, Tulsa, Okla., March 10-13, 1974.)*

Modified Claus sulfur plants have been used for many years to recover elemental sulfur from waste acid gas streams produced as a by-product of natural gas sweetening or crude oil refining. The growing economic impact of sulfur recovery and the increased emphasis on protecting the environment by reducing sulfur dioxide emissions has stimulated new research and development in improving sulfur recovery efficiency and prolonging catalyst life. To determine how various variables affect sulfur recovery, a computer model of the Claus process was developed which predicts plant performance under equilibrium and nonequilibrium conditions. The model is described. The model was tested by comparing computer results with measured plant performance data. Chemical reaction equilibria were predicted using free energy minimization. Claus reactions not achieving equilibrium in catalytic reactors were modeled by constraining the equilibrium solution. Kinetics of side reactions involving carbon monoxide, hydrogen, carbonyl sulfide, and carbon disulfide were treated by empirical partitioning procedures. Plant performance predicted by the computer model agreed well with measured plant performance data. Although the kinetics of some minor side reactions could not be predicted rigorously, the essential chemical reactions and the thermodynamic functions that relate values of process variables to sulfur recovery were accurately characterized. Potential applications of the model include routine plant surveillance, case-study process optimization, and process design studies. (Author conclusions modified)

45491 **APTIC NO. 68265**

Brandstetter, W., G. Decker, H. A. Kuck, and K. Reichel

STUDIES OF STRATIFIED CHARGE CONCEPTS BY VOLKSWAGEN. *(Ueber Untersuchungen von VW-Schichtladungskonzepten). Text in German. Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Div., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 12.1-12.12. 8 refs. (Nov. 4-8, Paper 12.)*

Experimental results from watercooled single-cylinder stratified charge engines with a subdivided combustion chamber are reported for both a scavenged and unscavenged prechamber. The development of the third generation 1.6 l air-cooled opposed type cylinder engine with a mechanical fuel injection system is described and engine maps are discussed. Very low nitrogen oxides and carbon monoxide emissions were obtained with the VW-1303 Beetle without impairment of fuel economy. Engine power output and vehicle acceleration are equal to those of the production engine in the same vehicle. Data is given for NOx, CO, and hydrocarbon emissions of different operating cycles.

45492 **APTIC NO. 68271**

Buchheim, R. and P. Walzer

LOW POLLUTANT COMBUSTOR DEVELOPMENT AS PART OF VOLKSWAGENS PASSENGER CAR GAS TURBINE RESEARCH PROGRAM. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 18.1-18.12. 3 refs. (Nov. 4-8, Paper 18.)*

Computer modeling results of the nonsteady state operating range of an experimental gas turbine engine for automobiles are presented along with emissions test data. Analysis of emissions during the federal driving cycle (F.D.C.) indicates that more than 60% of the carbon monoxide and hydrocarbon emissions occur during idling. On the other hand most of the nitrogen oxides produced occur during acceleration; idling and low road load also contribute to NOx emissions. Significant NOx reductions can be attained with either very lean or rich combustion zones. An R-type burner developed from combustor modeling programs meets 1977 American emission limits for hydrocarbons, carbon monoxide, and nitrogen oxide during F.D.C. simulation. Nitrogen oxide values below 2 g/mi can be obtained from such burners.

45493 **APTIC NO. 68290**

Buchner, Helmut and Helmut Saeufferer

THE SHORT AND MEDIUM-TERM DEVELOPMENT AND PRACTICAL APPLICATION OF HYDROGEN-POWERED VEHICLES. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 38.1-38.11. 2 refs. (Nov. 4-8, Paper 38.)*

The use of hydrogen as a fuel for motor vehicles is considered in terms of short and medium-term development possibilities. Although the lack of an infrastructure for hydrogen makes complete substitution of present internal combustion engines for pure hydrogen engines impractical for the next 20 yr, a gradual introduction of hydrogen technology in the near future (up to 1980) does appear feasible for urban transport vehicles. Titanium-iron hydride storage tanks are capable of storing about 30 times the chemical energy of a lead acid traction battery. The general application of hydrogen power for vehicles requires a hydride storage density capability of four to five times that of current hydrides or a sufficient primary energy capability for the production and liquefaction of hydrogen. Hybrid vehicles, using hydrogen as an additional fuel to gasoline may be feasible by 1990. Hydrogen offers equal or better combustion efficiency than gasoline and is inherently low polluting, bypassing such problems as carbon monoxide, hydrocarbon, lead, sulfur dioxide, and smoke emissions. Conventional internal combustion engines require only limited design changes to allow for the high ignition quality and flame speed of hydrogen.

45494 **APTIC NO. 69153**

Cavin, Daniel C.

A STUDY OF IRON AND ALUMINUM RECOVERY FROM POWER PLANT FLY ASH. *Iowa State Univ., Ames, Ames Lab., Atomic Energy Commission Contract W-7405-eng-82, Rept. IS-T-611, 121p., April 1974. 75 refs.*

NTIS: IS-T-611

A study of iron and aluminum recovery from power plant fly ash was performed to characterize a particular fly ash as a potential source of iron and aluminum. Magnetic separation of the iron-rich particles provided a fly ash fraction amenable to further iron extraction processes. Sulfuric acid leaching of the whole sample of fly ash as well as the fines (minus 200 mesh) showed a decrease in aluminum extractibility at increasing acid strengths. Lime sintering of the nonmagnetic fines revealed an increase in aluminum extractability at higher mole ratios of calcium oxide to aluminum oxide. The primary crystalline aluminum bearing mineral in the fly ash sample studied was mullite, with trace quantities of calcium aluminates also being observed. In comparison to aluminum recovery from clays and other aluminous materials, fly ash is much more refractory in nature. Preliminary roasting of fly ash prior to sulfuric acid leaching reduced the aluminum extractability by reinforcing the refractory character of the ash. (Author abstract modified)

45495 **APTIC NO. 68849**

Chaiken, Robert F.

IN SITU COMBUSTION OF COAL FOR ENERGY. *Bureau of Mines, Pittsburgh, Pa., Pittsburgh Mining and Safety Research Center, Bureau of Mines Advanced Mining Systems Program TPR 84, 14p., Nov. 1974. 10 refs.*

A concept of efficient thermal energy generation through the in situ combustion of coal and the on site conversion of that energy to electricity is discussed. It offers distinct advantages in the utilization of U. S. coal reserves. Analysis of data from previous underground coal gasification projects suggests that coal can be efficiently burned underground and that the burning process should be maintainable for time periods sufficient to power a commercial electricity generation plant. Analyses are also described related to some of the requirements of a 100-megawatt (thermal) in situ combustor, and several designs are suggested. There are still a number of important problem areas to be considered in the implementation of the concept, however. Atmospheric pollution control will require processing of the effluent gas stream to remove undesirable products such as particulates, sulfur dioxide, and nitrogen oxides. (Author abstract modified)

45496 **APTIC NO. 66520**

Chan, F. K.

A SASOL-TYPE PROCESS FOR GASOLINE, METHANOL, SNG, AND LOW-BTU GAS FROM

COAL (FINAL REPORT). Kellogg (M. W.) Co., Houston, Tex., Environmental Protection Agency Contract 68-02-1308, Task 13, Program Element 1AB013, EPA-650/2-74-072, ROAP 21ADE-010 (34), 93p., July 1974. 7 refs.

Costs and feasibility of manufacturing gasoline, methanol, SNG, and low-Btu gas from coal were assessed using the SASOL-type process. The SASOL plant was modified to suit the product spectrum of the projected plants. Capital investments for plants producing various end products are estimated based on published or in house information on a mine-mouth plant using Western U. S. coal. The total capital requirement and unit production cost are based on a shortcut version of the Panhandle Eastern Accounting procedure, recommended for coal conversion facilities. The capital investment and unit production costs decreases as follows: gasoline is greater than methanol, is greater than SNG and is greater than low Btu gas. The SASOL type process utilizes Lurgi air and oxygen blown gasification systems exclusively. (Author abstract modified)

45497 **APTIC NO. 68401**

Cheremisinoff, Paul N.

ODOR CONTROL IN THE CHEMICAL INDUSTRY. *Pollut. Eng. Tech., Proc. Int. Pollut. Eng. Congr., 3rd/1974 Int. Pollut. Eng. Expo., Chicago, Ill., 1974, p. 145-151. (Sept., Paper 22b.)*

The analysis and control of odors in the chemical industry are discussed. The human nose is the best qualitative instrument for odor analysis. The human hose is capable of detecting odors in quantities often impossible to measure with commercially available instrumentation or by chemical methods. Control methods include absorption or liquid scrubbing, adsorption on activated carbon and other porous solids, or incineration and combustion. Masking, counteracting odors, and dilution are also effective. Tables are presented on odor thresholds for various chemical compounds; selected major producing air pollution examples including hydrocarbons, halogen compounds, nitrogen compounds, and sulfur compounds; solubility in water of some odorous compounds; and the relative retention of some odorous compounds on activated carbon.

45498 **APTIC NO. 69094**

Cohn, J. G.

CATALYTIC CONVERTERS FOR EXHAUST EMISSION CONTROL OF COMMERCIAL EQUIPMENT POWERED BY INTERNAL COMBUSTION ENGINES. *Preprint, National Inst. of Health, Research Triangle Park, N. C., National Inst. of Environmental Health Sciences and Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Development, 10p., 1974. 19 refs. (Presented at the Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Durham, N. C., April 16-19, 1974.)*

The development of catalytic systems to purify internal combustion engine exhausts is reviewed. More than 10 years ago, PTX purifiers were introduced commercially to control the exhaust of engines using unleaded gasoline, diesel fuel, or liquefied petroleum gas. The purifiers are used on fork lifts, trucks, floor sweepers, underground locomotives, and stationary or portable engines. Emissions data are given for fork lifts using PTX purifiers. The PTX purifiers use monolithic ceramic structures for support. An estimate of the total operational time during the last 10 years of use of commercial PTX purifiers is about 1.2 times 10 to the 8th power hours. Some converters have exceeded 10,000 hours of operational life. No health problems have been reported connected with the PTX; on the contrary, health benefits have been derived from PTX use. The question of possible adverse effects of sulfate emissions has only been raised relatively recently, and no systematic study of such effects with commercial equipment appears to have been completed. However, during the years of use of PTX purifiers in confined spaces, no irritation or other health problems, including sulfate effects, have been reported. Particularly significant in this respect is the widespread use of PTX purifiers on diesel locomotives in underground mines, in spite of the relatively high sulfur content of diesel fuel. (Author conclusions modified)

45499 **APTIC NO. 68921**

Craig, J. M., B. A. Bell, T. A. LiPuma, and J. K. Allison

LIME/LIMESTONE SCRUBBING IN A PILOT DUSTRAXTOR-KEY WEST (FINAL REPORT). *Engineering Science, Inc., McLean, Va., Environmental Protection Agency Contract CPA 70-61, ROAP 21AQO-001, Program Element 1ABO13, Rept. EPA-650/2-74-077, 157p., Sept. 1974.*

NTIS: PB 237622/AS

Results of a 7-month series of nearly 200 pilot plant tests of a Dustraxtor limestone wet scrubbing system employed at a Key West steam power plant and the Tennessee Valley Authority s Shawnee plant in Kentucky are presented. Number 6 fuel oil containing 1-2.2% sulfur was burned at the Key West plant, while 2-4% sulfur pulverized coal was burned at the TVA plant. The tests included systematic variation of stoichiometry, reactant particle size, slurry concentration, pressure drop, and gas flow rate. Reactants tested included coral marl. Fredonia Valley limestone, dolomite, lime, aragonite, and precipitated calcium carbonate. Tests also included evaluation of spent reactant material, boiler injection of dry aragonite, addition of an inhibitor and catalyst, and effects on particulate and nitrogen oxide control. The Dustraxtor worked satisfactorily after the installation of an annular fresh water spray ring to reduce scale formation. Sulfur dioxide removal efficiencies varied up to 90-plus %, depending on the reactant used. Absorption efficiency increased significantly with increased pressure drop, decreased gas flow rate, increased stoichiometric ratio, and increased liquid-to-gas ratio. Other variables and an inhibitor and catalyst had no significant effect. Nitrogen oxide removal in the scrubber was negligible, though particulate removal by the total pilot plant system was excellent.

45500 **APTIC NO. 68904**

Crouch, W. B., W. G. Schlinger, R. D. Klapatch, and G. E. Vitti

RECENT EXPERIMENTAL RESULTS ON GASIFICATION AND COMBUSTION OF LOW BTU GAS FOR GAS TURBINES. *Preprint, American Society of Mechanical Engineers, New York, 11p., 1974. 7 refs. (Presented at the American Society of Mechanical Engineers, Gas Turbine Conference and Products Show, Zurich, Switzerland, March 30-April 4, 1974, Paper 74-GT-11.)*

A proposed system is presented for low pollution power generation by means of a combined cycle gas turbine system using low Btu fuel gas produced from high sulfur residual oil and solid fuel by gasification. Experimental results and conclusions are presented from a cooperative research program where high sulfur crude oil residue was partially oxidized with air to produce a 100 to 150 Btu/scf sulfur-free fuel gas for use in a turbine combustor. An FT4 gas turbine combustion chamber test demonstrated that low Btu gas can be efficiently burned with a large reduction in nitrogen oxide emissions. Gas turbine modifications required to burn low Btu gas are described, and projected NOx emissions for the low Btu gas compared to No. 2 fuel oil and natural gas are shown for an FT4 gas turbine. Integration of the gas turbine combined cycle system to a low Btu gasification process is described. The system provides an efficient method of generating electrical power from high sulfur liquid fuels while minimizing emissions of air and water pollutants. (Author abstract)

45501 **APTIC NO. 68924**

Ctvrtnicek, T., T. Hughes, C. Moscowitz, and D. Zanders

REFINERY CATALYTIC CRACKER REGENERATOR SOX CONTROL PROCESS SURVEY (PHASE I FINAL

REPORT). Monsanto Research Corp., Dayton, Ohio, Dayton Lab., Environmental Protection Agency Contract 68-02-1230, Task I, Phase I, Program Element 1AB013, Rept. EPA-650/2-74-082, ROAP 21ADC-031, MRC-DA-445, 246p., Sept. 1974. 126 refs.

NTIS: PB-237 756/AS

Conceptual techniques applicable to fluid catalytic cracker (FCC) regenerator off-gas sulfur oxide emission reduction were surveyed. They were evaluated with respect to their application to the FCC system and to the regenerator off-gas. The control techniques were compared with FCC feedstock desulfurization. Three approach alternatives to desulfurization of FCC regenerator flue gas were investigated: desulfurization of the feed to the cracking operation that would result in sulfur emissions of 200 ppm; fluid catalytic process modification; and selection and specification of the most feasible regenerator flue gas desulfurization system. The control techniques were compared with FCC feedstock desulfurization. The economics of all systems were compared. Sulfur emission control can most effectively be achieved through steam contacting of the spent cracking catalyst. (Author abstract modified)

45502 **APTIC NO. 68710**

Dickerson, Richard C. and Belur N. Murthy

SCOPE OF WET SCRUBBERS FOR ODOR CONTROL. *Ann. N. Y. Acad. Sci., vol. 237:374-388, Sept. 27, 1974. 31 refs. (Presented at the Odors: Evaluation, Utilization, and Control Conference, Oct. 1-3, 1973.)*

The use of wet scrubbers for odor control is reviewed. Odor control by wet scrubbing involves the transfer of odorous substances from the gas phase to the liquid phase by one or more of the following mechanisms: condensation of vapors, absorption by the liquid, chemical reaction with the liquid reagent, and adsorption by particulates before or after transfer to the liquid phase. The effectiveness of condensation for odor removal depends on the temperature difference between the gaseous emissions and the scrubbing zone, the boiling point and volatility of the odorous compounds, the moisture content of the gas stream, the degree of gas-liquid contact in the scrubber, and the relative heat capacity and volatility of the absorbing liquid. The rate of odor removal by absorption depends on the gas-liquid interfacial area, the concentration gradient of each odorous component between the main gaseous and liquid phases, the solubility of the odorous gas in the absorbing liquid, and the diffusion of odors in the gas phase. The rate and capacity of absorption of odors by the scrubbing liquid can be increased by chemical reaction of the odorants in the liquid phase or by suspending adsorptive or reactive solid particles in the liquid. Wet scrubber development studies for rendering plant odor control show that strong oxidizing agents are effective for removing most odor causing components. Major odorous compounds and their industrial sources are listed, and various types of wet scrubbers are discussed in terms of their most suitable application.

45503 **APTIC NO. 69168**

Dowd, Edward J.

AIR POLLUTION CONTROL ENGINEERING AND COST STUDY OF THE PAINT AND VARNISH INDUSTRY (FINAL REPORT). *Air Resources, Inc., Palatine, Ill., Office of Air and Water Programs Contract 68-02-0259, Rept. EPA-450/3-74-031, 552p., June 1974. 51 refs.*

NTIS: PB 238 058

The technical and economic aspects of emission controls in the paint and varnish manufacturing industry were analyzed. Industry structure and statistics, the nature and sources of emissions, technical problems associated with emission controls, cost of emission control equipment, and the overall economic impact of air pollution control are among the major topics investigated. Significant air pollution problems are localized odor nuisance complaints and fugitive solvent hydrocarbon vapors. Primary emphasis is placed on emissions from varnish and resin cooking. Primary and secondary sources of gases and particulate emissions were identified. Emission factors were developed based on industry questionnaires as a function of production capacity and type of product. A detailed discussion of the existing state of the art of air pollution control is presented. General statistics for the pigment industry are presented including a review of the pigments with most potential for significant air pollution emissions. The major pigments studied were zinc oxide, chrome pigments, iron oxide, and titanium dioxide. Emission control technology was studied and includes type and performance of currently used emission control systems and other potential methods of control. (Author abstract modified)

45504 **APTIC NO. 69113**

Dyck, A. W. J.

THE PENTAPURE IMPINGER. *Am. Paper Ind., 56(2):16-17, Feb. 1974.*

The operation of the Pentapure impinger system for removing airborne particles and gaseous pollutants from industrial stacks is described. The system uses the existing energy in the gas stream to remove particulates by agglomeration, followed by impingement. It operates with relatively low energy consumption and extremely low water usage. The system is installed at a pulverized coal burning boiler where it successfully removes 99% of particulates from the flue gases, leaving only 6 lb/hr of particulates, compared to the state allowable 18/lb/hr. The code for sulfur dioxide removal in burning low sulfur coal is met.

45505 **APTIC NO. 68259**

Ehrhardt, Helmut, Heinz Gunther, and Hans May

THE INFLUENCE OF IONIZATION PROCESSES ON THE REACTION KINETICS OF COMBUSTIONS. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Sys. Dev. 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 6.1-6.10. 6 refs. (Nov. 4-8, Paper 6.)*

The use of an electrical discharge to increase the ionization in an ignited fuel/air mixture is proposed for the decomposition of nitric oxide in exhaust gases from internal combustion engines. Most of the positive charge in a moderately high pressure hydrocarbon-air combustion system is present as nitric oxide cation, while practically all negative charge exists as free electrons. Since the natural ionization in hydrocarbon-air flames is low even with hydrocarbon additives (0.1% NO dissociation at most), an external electrical discharge is suggested for increasing NO ionization. An estimated 5-7% of the mechanical work of a cylinder appears necessary to achieve an electrical work value of 1.5 Kw and a gas ionization somewhat less than 1%. An experimental arrangement consisting of a constant volume reaction chamber and a high voltage discharge source is described for testing the proposed ionization method for reducing NO emissions.

45506 **APTIC NO. 68400**

Emerson, H. T.

SULFUR DIOXIDE RECOVERY: EMISSION CONTROL IN HEAVY CHEMICAL PLANTS. *Pollut. Eng. Tech., Proc. Int. Pollut. Eng. Congr., 3rd 1974 Int. Pollut. Eng. Expo., Chicago, Ill., 1974, p. 189-193. (Sept., Paper 26.)*

The operation of the sulfur dioxide recovery scrubbers at four sulfuric acid plants of the Olin Corp. is described. Two scrubbers use ammonium hydroxide as the absorbent. The end product is ammonium sulfate solution which is used in the production of high grade fertilizers. Brink mist eliminators were installed after the scrubbers were required to meet the state of Texas regulations specifying a maximum limitation of 30% opacity at point of stack gas discharge. Opacity was reduced from higher than 40% to from 5-15% and particulate loadings were cut by over 99%. One of the scrubbers reduced the SO2 concentration from 5000 ppm to less than 200 ppm. Both scrubbers which use sodium sulfite systems are regenerative. Sulfur dioxide is recovered as a high quality gas and used for the production of sulfuric acid. The plant in Paulsboro, N. J. is capable of reducing SO2 levels from 6000 ppm to below 500 ppm. The recovery plant at Curtis Bay, Md. was designed to reduce the SO2 concentration in the gas stream, 78,000 acfm, from 4500 ppm to 250 ppm.

45507 **APTIC NO. 68491**

Endo, Masao

DESULFURIZATION OF SMOKE BY THE KBCA ACIDIC AMMONIUM SULFATE- GYPSUM RECOVERY METHOD. *(KBCA sansei ryuan-sekko kaishu haien datsuryu-ho). Text in Japanese. Sekko to Sekkai (Gypsum Lime), no. 131:168-172, 1974. 3 refs.*

More than 80 apparatuses of the KBCA type are actually operating at present. This process is free from the handling of slurries. Sulfur dioxide is first absorbed with slightly acidic ammonia sulfate solution. The SO2 thus absorbed is oxidized with air under controlled pH conditions to give (NH4)2SO4. Part of the solution is taken out and mixed with CaO or calcium hydroxide to recover gypsum. The residual solution is recirculated for the absotption of SO2. The pH of the solution is kept at 3-4. Under this condition, the partial pressure of NH3 is less than 1 ppm. Therefore, aerosols are not formed. The procedures of oxidation and crystallization are performed at 50-60 C. This temperature is automatically maintained without any heating. All the processes are allowed to proceed at 1 atmospheric pressure. The corrosion prevention of the vessels is made easy because the pH of the solution is higher than 3. The equilibrium between SO2 and water at 50, 55, and 60 C is considered.

45508 **APTIC NO. 68289**

Escher, William J. D.

FUTURE ROLES FOR HYDROGEN FUEL IN SURFACE TRANSPORTATION SYSTEM APPLICATIONS. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 37.1-37.11. 11 refs. (Nov. 4-8, Paper 37.)*

The use of hydrogen as an alternative fuel for motor vehicles is discussed. Production, distribution, and utilization of hydrogen energy appears to be entirely feasible with acceptable safety levels. Most powerplants used in transportation vehicles are fully amenable to conversion to hydrogen fuel, though substantial redesign for performance optimization is generally required. Onboard vehicle storage of hydrogen requires a considerably more sophisticated and operationally complex containment means than presently used hydrocarbon fuels require. Either a highly insulated tank for cryo-hydrogen or a metal hydride bed with heat exchange means for hydride storage will be required. Hydrogen fuel is extremely low polluting, with emissions from a hydrogen airbreathing engine being limited to nitrogen oxides and, possibly, hydrogen peroxide.

45509 **APTIC NO. 68254**

Finsterwalder, G. and H. Kuepper

LOW-EMISSION VEHICLE ENGINE BASED UPON THE AD MULTIFUEL PROCESS. *(Emissionsarmer Fahrzeugmotor auf der Basis des AD - Vielstoffverfahrens). Text in German. Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. A 2.5.1-A 2.5.9. (Nov. 4-8, Paper A 2.5.)*

An automobile engine with the power-to-volume ratio of the Otto engine and the economy of a diesel engine and capable of meeting exhaust emission regulations without after-treatment was investigated. The basis for the investigation was the supercharging possibilities of the AD-Multifuel process, a direct injection process with applied ignition derived from the diesel engine. No incipient knocking was detected within the operating range examined.

45510 **APTIC NO. 68926**

Fleming, Donald K. and John C. Sharer

REGENERATIVE REACTOR FOR NOX ABATEMENT (FINAL REPORT). *Inst. of Gas Tech., Chicago, Ill., Picatinny Arsenal Contract DAAA 21-72-C-0455, Proj. AMCMS 4932.05.4114, Rept. 8935, 217p., May 1974. 36 refs.*

NTIS, DDC: AD-779 455

A novel reactor, capable of regenerating heat of reaction into the inlet stream, was analyzed for application to nitrogen oxides reduction in nitric acid tail gas. The reactor is based upon the catalytic reaction of NOx and oxygen with methane, but incorporates internal heat recovery to avoid the problems of lightoff, excessive temperature, and necessarily low oxygen concentration. The process was evaluated thermodynamically and kinetically over conventional catalysts. The device was simulated mathematically and isothermal bed characteristics were obtainable. A pair of fixed-bed reactors was operated cyclically with thermal regneration and simulated the expected performance of the rotary regenerative wheel reactor. During the reaction cycle of this system, 0.3% nitric oxide was chemically reduced with methane to 16 ppm. Simultaneously, 99.5% removal of the oxygen in the simulated tail gas was achieved. Even with a degraded catalyst on one test the Environmental Protection Agency specifications of 209 ppm NO were achieved. (Author abstract modified)

45511 **APTIC NO. 68962**

Fujii, Shoichi, Shin Yoshizawa, Keiichi Imano, Koyo Maekawa, and Osamu Minamino

STUDIES ON THE PERFORMANCE CHANGE OF AIR FILTER DUE TO DUST COLLECTION. *(Taiki funjin hoshu ni yoru eafiruta no seino henka ni kansuru kenkyu). Text in Japanese. Preprint, Japan Society of Architecture, p. 135-136, 1974. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4068.)*

To obtain necessary information for the maintenance of air filters, various types of air filters were attached to testing ducts placed in four buildings in Tokyo, and the variation in air filter performance was investigated over a period of 3 yr by measuring the amount of dust collected, pressure loss, and collecting efficiency. The types of filter tested were glass fibers, acetate fibers, nylon fibers, and oil-treated glass fibers. In the case of glass fibers, the integrated amount of pollutant (average dust concentration in atmosphere times the amount of air passed through the filter) and the weight increase of dust collected on the filter showed a proportional relationship. The acetate filter showed a similar tendency to that of the glass fiber filter, however, the pressure loss was irregular. In the case of simultaneous testing of nylon, acetate, and oil-treated glass fiber filters, the relationships between integrated amount of pollutant and weight increase of dust collected on the filter were linear, and the difference due to the filter type was slight. However, the pressure loss of acetate fibers was markedly higher than that of the others.

45512 **APTIC NO. 68434**

Goddin, C. S., E. B. Hunt, and J. W. Palm

CBA PROCESS UPS CLAUS RECOVERY. *Hydrocarbon Process., 53(10): 122-124, Oct. 1974. 5 refs. (Presented at the Gas Processors Association Meeting, Denver, Colo., March 25-27, 1974.)*

An Amoco Cold Bed Adsorption process which can be adapted for cleanup of the tail gas from an existing two-reactor conventional Claus plant is described which increases overall sulfur recovery from hydrogen sulfide and sulfur dioxide to about 98-99.5% at relatively low investment-operating costs. Recovery improvement is realized by reducing the reaction temperature below the dew point of the sulfur, thus reducing sulfur deposition on the catalyst and catalyst regeneration requirements. The process involves the addition of two CBA reactors and condensers, plus necessary piping and timer-controlled switching valves. The catalyst and materials of construction are the same as used in conventional Claus plants, and energy consumption is low. No special chemicals are required, and no waste disposal problems are created. Regeneration with a relatively low temperature stream, indigenous to the Claus process, minimizes cyclic thermal stresses on the catalyst and can eliminate the need for an external regeneration system involving a separate fired heater, condenser, and recycle blower. The contractor's cost for addition of the CBA process to an existing two-reactor Claus plant is about 50% of the cost of the Claus plant.

45513 **APTIC NO. 69030**

Goericke, Peter

HYDROGEN - ENERGY CARRIER OF THE FUTURE? *(Wasserstoff - Energietraeger der Zukunft)? Text in German. Energie Tech., 26 (9):213-217, 1974. 2 refs.*

Starting from the necessity of a replacement of fossil fuels in the future, the usefulness of gaseous or liquid hydrogen as an energy carrier is examined. Apart from the various hydrogen production processes such as electrolysis, dissociation, and thermal cracking of water, the possibilities of energy transmission and energy storage for hydrogen are discussed and compared with conventional fuels and electricity. The use of hydrogen as fuel for domestic heating is feasible. Hydrogen has the great advantage that it can be catalytically burned leaving no residues. No waste gas chimney is required and the efficiency compared to conventional heaters is considerably better. For use in automobiles the lack of a suitable tank at present makes the application of hydrogen impossible. The heavy weight of pressurized tanks and hydrides necessary for hydrogen is a disadvantage in comparison with conventional fuels. The use of liquid hydrogen would require super-insulated pipes and tanks. Through evaporation losses of hydrogen much energy would be constantly lost. Synthetic methanol obtained from hydrogen and carbon monoxide seems to be a more promising fuel for automobiles in future. Experiments have shown that conventional engines can be well adapted to operation with methanol. The great advantage would be the absence of exhaust gas emissions. The disadvantage is the two times lower energy density and the toxicity.

45514 **APTIC NO. 68274**

Gorum, A. E., J. J. Burke, E. M. Lenoe, and R. N. Katz

CERAMIC MATERIALS AND COMPONENTS FOR SMALL AUTOMOTIVE GAS TURBINE ENGINES-TECHNOLOGY ASSESSMENT. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 21.1-21.11. 5 refs. (Nov. 4-8, Paper 21.)*

A survey of recent developments in ceramic materials and ceramic gas turbine automobile engine components is presented along with an assessment of technological gaps which exist in making a transition from 200-hour technology demonstration to a true long-term engine demonstration. The use of ceramics permits higher turbine inlet temperatures, more efficient heat exchange, improved fuel economy, and lowered emissions at the higher turbine inlet temperatures (2500 F). Silicon nitride is one ceramic material which demonstrates improved high-temperature bend strength and creep properties. Silicon aluminum oxynitrides promise improved creep behavior compared to silicon nitride. Critical research tasks which remain include: rotor development, regenerator/recuperator development, and durability testing of stationary hot flow path components.

45515 **APTIC NO. 68711**

Graves, Willa A.

SMOGLESS COMBUSTION APPARATUS. *(Assignee not given.) U. S. Pat. 3,799,076. 7p., March 26, 1974. 6 refs. (Appl. May 4, 1972, 4 claims).*

A smogless incinerator for combustible waste materials is described which overcomes the complexity, lack of portability, and auxiliary flame fuel requirements associated with incinerators using afterburning for pollutant reduction. The apparatus includes a pair of filter chambers situated above a combustion chamber. Each filter chamber contains a supply of liquid through which the combustion products to be filtered are drawn, and each chamber includes a gas dust disposed beneath the surface of the liquid as well as an air outlet situated beneath the gas duct within the supply of liquid. Air supplied to the outlet under pressure causes turbulence of the liquid in and about the gas duct. The turbulence in the liquid enhances the mixing of the partial combustion products from the combustion chamber with the liquid to assure that airborne particles from the chamber are trapped in the liquid. The liquid is forced to bubble through a perforated baffle plate to ensure further prolonged contact with the particles. (Author summary modified)

45516 **APTIC NO. 68263**

Haertel, G. R.

CATALYTIC POST-COMBUSTION OF THE EXHAUST GASES OF OTTO CYCLE ENGINES WITH CONTROLLED ADMIXTURE OF SECONDARY AIR. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 10.1-10.10. 4 refs. (Nov. 4-8, Paper 10.)*

The combination of a catalytic afterburner and a secondary air control system allows for the simultaneous reduction of carbon monoxide, hydrocarbon, and nitric oxide exhaust components of internal combustion engines in only one catalyzer bed, providing the gases are kept stoichiometric within very close limits. The continual measuring of the oxygen contents upstream of the catalyzer permits the exact adaptation of the admixture of secondary air by a feedback control system. Engine operation with a mixture slightly leaner than stoichiometric permits good driveability and good utilization of fuel. Employment of the catalyzer and secondary air control system along with adaptation of the aspirated mixture composition, ignition advance, and exhaust gas recirculation results in emission values for carbon monoxide, hydrocarbons, and nitric oxide that are below the original emission limits for 1976 vehicles.

45517 **APTIC NO. 68284**

Hagey, Graham and Andrew J. Parker, Jr.

ALTERNATIVE AUTOMOTIVE FUELS - STATUS AND SUMMARY OF IN-PROGRESS RESEARCH ACTIVITIES. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 32.1-32.13. 3 refs. (Nov. 4-8, Paper 32.)*

The present state of knowledge regarding alternative motor vehicle fuels as partial or complete substitutes for gasoline and petroleum distillates is reviewed. Alternative fuels considered include: synthetic gasoline and distillate hydrocarbon fuels from sources like coal, oil shale, and organic waste products; pure methanol; methanol-gasoline blends; and hydrogen. Coal (particularly from strip mining processes) is the largest and most probable domestic energy resource for synthetic fuel production, followed by oil shale. The production cost in the post-1985 period for gasoline and distillate hydrocarbon fuels derived from oil shale is estimated to be competitive with current costs of conventional petroleum-based sources. Equivalent liquid hydrocarbon fuels derived from coal are more expensive. Pure methanol which has seen limited success in powering existing spark-ignition engines offers increased efficiency, though fuel economy (in miles per gallon) is half that with gasoline. A greater near-term advantage may be possible with the use of methanol-gasoline blends. Hydrogen promises extremely low exhaust emission levels and a better fuel economy (on an energy-expended-per-mile basis) than gasoline, though maximum engine power output for a given engine size is reduced significantly.

45518 **APTIC NO. 68282**

Hamilton, W. F.

IMPACTS OF ELECTRIC CAR USE IN LOS ANGELES. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 30.1-30.10. 7 refs. (Nov. 4-8, Paper 30.)*

A computer program is developed to investigate environmental energetic, and socio-economic impacts of electric vehicle usage in the greater Los Angeles region during the 1980-2000 time frame. Four-passenger subcompacts are chosen with performance slightly below that of current low-performance conventional subcompacts. Battery types investigated include: lead-acid, nickel-zinc, zinc-chloride, and lithium-sulfur. An urban driving range of about 48 km/day is assumed along with simple overnight recharging as opposed to a system of battery exchange and recharge stations. Estimates indicate that electric cars promise reduced total energy consumption, though they offer little or no energy savings relative to existing internal combustion engine subcompacts of comparable size and superior performance. Although the electric car can dramatically reduce emissions of key Los Angeles air pollutants, existing legislation requiring 90% reductions of conventional auto exhaust emissions during the 1970 s will reduce pollution to the point where it will no longer be a critical problem. Reductions of 15, 20, 80, and 21% in ozone, nitrogen dioxide, carbon monoxide, and particulates, respectively, can be expected for 80% electric car use in 1990, although oil-fired recharging of electric cars will result in a 21% increase in sulfur dioxide pollution. Higher initial costs for electric vehicles are projected to be offset by lower maintenance, longer life, and reduced fuel costs. Higher battery depreciation costs for lead-acid and nickel-zinc battery cars will result in 22-66% higher overall costs as compared to conventional subcompacts.

45519 **APTIC NO. 68614**

Hanf, E. B. and J. W. Macdonald

WET SCRUBBERS FOR CORROSIVE ENVIRONMENTS: AN ECONOMIC EVALUATION. *Preprint, American Inst. of Chemical Engineers, New York, 22p., 1974. 5 refs. (Presented at the American Institute of Chemical Engineers. National Meeting, 77th, Pittsburgh, Pa., June 2-5, 1974.)*

A selection guide and economic evaluation of wet scrubbers used in corrosive environments are presented. Scrubber designs covered in the evaluation include: static bed packed tower, wet cyclone, venturi, spray tower, and eductor venturi type. All internals are assumed to be fabricated of thermoplastic or fiberglass reinforced plastic where applicable. The selection guide covers applications involving the control of noxious gases (high solubility, low solubility, and low solubility with chemical reaction), mists under 10 micron, entrained liquids over 10 micron, fumes under 1 micron, dusts over 5 micron (low loading and high loading), and dusts under 5 micron. For example, if the pollutants in a certain application are a combination of a highly soluble gas and fumes under 1 micron requiring collection efficiencies above 95%, it would be necessary to use a combined train of a venturi followed by either a countercurrent or crossflow packed scrubber. Data are also supplied to allow for the estimation of packing height required for various collection efficiencies of highly soluble gases and low soluble gases accompanied by a rapid chemical reaction. Tables are provided for estimating initial first cost, complete system cost, and operating and maintenance costs.

45520 **APTIC NO. 68380**

Hardison, L. C. and L. R. Steenberg

CRITERIA FOR CHEMICAL ODOR CONTROL SYSTEMS. *Ann. N. Y. Acad. Sci., vol. 237:363-373, Sept. 27, 1974. 9 refs. (Presented at the American Society of Heating, Refrigerating, and Air Conditioning Engineers and Air Pollution Control Association Conference, Odors: Evaluation, Utilization, and Control, Oct. 1-3, 1973.)*

Systems for the control of industrial odors are discussed including dispersion, adsorption, incineration, and wet scrubbing. Practical odor control requires quantification of the source and establishment of the degree of reduction required to prevent odor nuisances. Dispersion is an effective odor control tool and the degree of dilution produced by the stacks can be estimated by dispersion methods or models. The degree of reduction in odor concentration by an abatement device as an oxidative chemical scrubbing system, a thermal incinerator, or an adsorption system are influenced by the economics of achieving the various attainable levels of abatement. Chemical scrubbing systems are best applicable when the gas volumes are high and the odorant materials are potent and present in low concentrations. Continuous odorous operations are costly to treat with thermal incineration but respond well to chemical scrubbing. The economics of oxidative chemical scrubbing systems are presented for application in controlling odor from heating plants and animal material and from petroleum derived materials such as paint solvents and coating materials.

45521 **APTIC NO. 68270**

Hartmann, Albrecht

PROGRESS OF ROTARY ENGINES, TYPE NSU/WANKEL. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 17.1-17.26. 2 refs. (Nov. 4-8, Paper 17.)*

Improvements in rotary engines leading to low exhaust emissions and low fuel consumption are reviewed. Sealing grids with a low wear rate are described for attaining low gas leakage and good fuel economy. Although nitrogen oxide emissions from the rotary engine are inherently low, hydrocarbon emissions are higher than normal internal combustion engines due to the delayed combustion of the rotary engine. The use of a thermal reactor in the exhaust system allows for low hydrocarbon emissions with fuel consumption levels increased by 15-21% over previous rotary engines. Carbon monoxide emissions are also reduced with exhaust reactors. Prototype rotary engines with low fuel consumption are presently capable of meeting 1977 American emission requirements. A new generation of rotary engines with a stratified charge modification is in the advanced state of development.

45522 **APTIC NO. 69022**

Hatanaka, Toshiki

NOX CONTROL MEASURES FOR HEATING FURNACES. *(Kanetsuro no NOx yokusei taisaku). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 26(10):29-32, Oct. 1974.*

The formation mechanisms of nitrogen oxides are extremely complex, and only three processes, thermal, fuel, and prompt nitric oxide formations, are known. No single efficient and effective control method for all three is known. Using a heating furnace and test burners, low NOx burner experiments were conducted. Using a model furnace and recreating the same furnace temperature and actual conditions of a heating furnace, fuels and burner modifications were varied for the experiments. With a liquid natural gas burner, adjusting the air ratio as close to 1.0 as possible, the formation of NO was controlled considerably. When the excess air ratio was 1.05, the result was extremely good. But the burner is still in its experimental stage. A presently operating beam heating furnace was converted from fuel oil to raw butane, and a low NOx burner model was tried. In this case also, the air ratio of 1.0 brought a successful decrease in the NO formation. The effects of steam injection produced different results depending on the burner design, but generally the injection was considered effective. With a fuel oil burner of furnace temperature close to 1300 C, NOx control is extremely difficult. Using one previously tested burner, four types of modifications were added to see the results. In all cases, the air ratio close to 1.0 produced the best results, but they were not as good as the LNG burner. In the order of the best effect, the results were: 0.35 kg/10,000 kcal steam injection plus flue gas recirculation; steam injection and two-step combustion; two-step combustion only; steam injection only; and the previous burner without any modification.

45523 **APTIC NO. 68690**

Hayakawa, Kazuya

AIR POLLUTION AND CLEAN AIR MEASURES. *(Taiki osen boshi to kuki seijo taisaku). Text in Japanese. Insatsu Zasshi (Print. J.), 57(3): 9-15, March 1974. 2 refs.*

According to the statistics of August 22, 1973, the skies of Tokyo are polluted annually by 82,000 tons of sulfur oxides, 96,000 tons of nitrogen oxides, 593,000 tons of carbon monoxide, 219,000 tons of hydrocarbons, 23,000 tons of dusts, and 1300 tons of aldehydes. Up to 95% of the sulfur oxides and dusts are emitted from fixed sources, but 69% of NOx, 67.1% of HC, and 87% of aldehydes are emitted from automobiles and other mobile sources. The standards for industrial clean rooms where precision machinery and electronic mechanisms are handled, or bioclean rooms which house pharmaceutical and medical facilities, and the standards for the environment are extremely high; but the normally hygienic standards are much less stringent and the standards for a 7-day week and a 24-hour day are quite different from a five-day week and an eight-hour day. For selecting an air cleaning system, first the pollutant collection rate of the equipment and especially the purification efficiency for harmful pollutants must be determined; the ventilation system and pressure loss must be calculated and the blower must be selected; the installation location must be selected; humidity, temperature, air quantity controls and purity controls must be checked; the method of maintenance and manpower required for operation must be determined; the treatment method for collected pollutants must be examined; the cost for installation and maintenance must be determined; and the type of air cleaning equipment and capacity must be selected.

45524 **APTIC NO. 68977**

Hayakawa, Kazuya, Shuji Fujii, and Yoshiichiro Watanabe

KASUMIGAZEKI AREA AIR-CONDITIONING AND HEATING PLANS AND AIR POLLUTION. *(Kasumigazeki chiku chiiki reidanbo keikaku to taiki osen). Text in Japanese. Preprint, Japan Society of Architecture, Tokyo, p. 177-178, 1974. 2 refs. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4089.)*

The feasibility of regional air-conditioning and heating was examined with respect to the Kasumigazeki area of Japan. Technology, economics, and environmental impact were calculated on the basis of various models. Because this area has a high heat load density, the possibility of regional air-conditioning and heating is distinctly present.

45525 **APTIC NO. 68735**

Hayford, John S., Lester P. VanBrocklin, and Mark A. Kuck

DESULFURIZATION OF CLAUS PLANT TAIL GAS USING THE PHOSPHATE PROCESS. *Preprint, Gas Processors Assoc., 24p., 1974. (Presented at the Gas Processors Association, Annual Convention, 53rd, Denver, Colo., March 25-27, 1974.)*

The phosphate process is a simple and efficient system capable of reducing the sulfur dioxide levels in diverse waste gas streams to low limits which meet present and anticipated atmospheric release standards. Typical applications are Claus plants, refineries, power plants, and smelters. In Claus plant applications, the incineration converts all sulfur compounds in the tail gases to SO2 which is then absorbed in a sodium phosphate buffer solution. The SO2-laden solution is then contacted with hydrogen sulfide, producing elemental sulfur which is recovered. The treated gas contains less than 100 ppmv of SO2; a small amount of Glauber salts are obtained as a byproduct. A pilot plant was successfully operated for over a year to remove sulfur compounds from the tail gas of a commercial Claus unit. Capital costs are presented based on firm engineering of a 200 LTPD Claus plant abatement system. A particularly attractive adaptation of the phosphate process is the consolidation of a Claus plant and its abatement system into a single, integrated plant with significant cost advantages over the dual system. (Author abstract)

45526 **APTIC NO. 68287**

Heitland, H., W. Bernhardt, and W. Lee

COMPARATIVE STUDIES ON METHANOL- AND GASOLINE-POWERED MOTOR VEHICLES. *(Vergleichende Untersuchungen von methanol- und benzinbetriebenen Kraftfahrzeugen). Text in German. Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 35.1-35.11. 2 refs. (Nov. 4-8, Paper 35.)*

Engine performance and exhaust emissions were evaluated in comparative studies on methanol- and gasoline-powered automobiles. A Volkswagen Scirocco with a transversely-mounted four cylinder engine was used as the test vehicle. Hydrocarbon, carbon monoxide, and nitrogen oxide emissions from the methanol-powered vehicle were: 2.5, 9.45, and 1.89 g/mi, respectively, as compared to 4.45, 22.08, and 5.71 g/mi, respectively, for a similar gasoline-powered vehicle. The emission values of the methanol-powered vehicle compared favorably to the 1975 federal standards of 1.5, 15.0, and 3.1 g/mi for hydrocarbons, carbon monoxide, and nitrogen oxides, respectively. Polynuclear aromatic emissions from the methanol-powered vehicle were negligible, though aldehyde emissions were higher at all air-fuel equivalence ratios than those from the gasoline-powered vehicle. Aldehydes from the methanol-powered engine were appreciably reduced however, by using 1:10 water-methanol mixture; nitrogen oxides, hydrocarbons, and carbon monoxide were also near their lowest levels at this mixture composition. Methanol fuel is additionally advantageous since it can be produced on a non-mineral oil basis (e.g., from coal) at a competitive price and stored and distributed as a liquid fuel. Higher combustion efficiency can also be obtained with methanol fuel.

45527 **APTIC NO. 69164**

Helfinstine, R. J., N. F. Shimp, M. E. Hopkins, and J. A. Simon

SULFUR REDUCTION OF ILLINOIS COALS--WASHABILITY STUDIES. PART 2. *Ill. State Geol. Surv. Circ., no. 484, 32p., 1974. 4 refs.*

Washability (float-sink) tests were run on 28 coal samples from 22 Illinois coal mines. Primary attention was given to potential reduction of sulfur in the coals. In only a few of the coals tested was the sulfur content reduced to less than 1.5%, and in a few of the coals the lowest percentage of sulfur obtained with a reasonable recovery was greater than 3.5%. The maximum and average reductions in sulfur were 63% and 38%, respectively, with 80% recovery. Washability tests were made on both 10-pound and 100-pound representative splits from 23 samples. The results from these tests with the two quantities exhibited a close correlation. A fairly good correlation is shown between data from cores 2 inches in diameter and data from column samples obtained from nearby locations in the mines. (Author abstract modified)

45528 **APTIC NO. 69696**

Hirayama, Seafuji

TREATMENT FOR COATING PROCESS WASTE GAS. *(Toso haigasu no shori ni tsuite). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 41(8):54-56, Aug. 1974.*

The pollutants emitted during the coating process are: vapors from various chemical liquid tanks, mists and solvent vapors caused by overspray (though 95-99% of mists are eliminated by the coating booth aerosol eliminators), formaldehydes, combustion gas, and solvent vapor at the dryer, and other types of vapors in the setting booths. The concentration of organic solvent mists emitted in coating booths is usually 50-100 ppm. A flowsheet for deodorization and aerosol treatment by direct combustion and catalytic oxidation shows: collection of various vapors and mists from both manual coating booths, automatic booths, and dryers; an incinerator; a heat exchanger; a water separater; heat recovery by the factory heating system; and the emission of clean air. A flowsheet combining activated carbon and absorption shows: pretreatment of mists and vapors from manual and automatic booths and dryer; the absorption tank; the activated carbon layer with steam; and emission of treated gas. From the absorption tank, the used absorbent is sent to the recovery tank and solvent and absorbent are separated. From the activated carbon layer, the solvent is separated, and the condensate and solvent are sent to appropriate receptacles.

45529 **APTIC NO. 69845**

Hirose, Akira

DUSTLESS LOADING DEVICE. *(Dusutoresu shukka sochi). Text in Japanese. Sangyo Kikai (Ind. Machinery), no 287:37-39, Aug. 1974.*

The previous method of loading powdery or small particulate material on a truck created tremendous amounts of dusts and also required at least two operators. With this new equipment the loading is dustless and simple and requires only the truck driver. The platform car has wheels and runs on rails. The platform has its own motor and acceleration control device and an elevation control motor for the loading nozzle. The loading nozzle is a double pipe; the powder descends down the inner tube and the space between the two pipes is the passage for suction air which draws any dusts created during the loading operation. The lower part of the nozzle is movable and at the end of the nozzle is a flexible skirt in which is a mercury switch. An auger in the inner pipe curtails the speed of descending powder (or small particulates). The air drawn through the passage between two pipes is sent through a duct into a bag filter; the collected dust is sent back to the nozzle through a screw conveyor. The duct connected with the platform car is flexible with accordion pleats. The truck is moved into the loading zone until the skirt of the nozzle lightly touches the truck cart bottom. The driver opens the gate damper and the powder material falls onto the truck. He can operate the loading switch, the nozzle adjustment switch, and the gate damper switch contained in one box and can control the loading by watching the condition. When the powder material forms a mound the mercury switch inside is bent slightly and automatically elevates the loading nozzle; at this point the driver can close the gate damper.

45530 **APTIC NO. 68277**

Hoagland, Lawrence C.

RECENT PROGRESS IN DEVELOPMENT OF THE EPA PROGRAM ON LOW EMISSION AUTOMOTIVE STEAM ENGINES. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statusseminar. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 24.1-24.11. 6 refs. (Nov. 4-8, Paper 24.)*

Progress is summarized on an Environmental Protection Agency program to develop an automotive steam engine employing a 4-cylinder uniflow reciprocating expander and a unique low-emission homogeneous combustor. Pure water is used as the working fluid. Engine dynamometer tests indicate that the system yields exhaust emissions less than one-half of the 1978 federal standards. Estimated cold start federal driving cycle emissions in grams/mile for nitrogen oxides, carbon monoxide and unburned hydrocarbons are: 0.19, 0.39, and 0.16 as compared to the 1978 standards of 0.40, 3.40, and 0.41. The system produces fuel economy and acceleration performance equal to current emission controlled gasoline engine vehicles. The steam engine is soon to be installed in a 2100 kg car for chassis dynamometer tests and control system development. (Author summary modified)

45531 **APTIC NO. 68294**

Hofbauer, P., B. Wiedemann, L. Siencnik, W. Fausten, and U. Schmidt

SYSTEM ANALYSIS OF DRIVE UNITS. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statusseminar. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 43.1-43.7. (Nov. 4-8, Paper 43.)*

A system analysis approach designed to aid in the selection of competing automobile power plant alternatives is described. The decision basis is formed by time dependent functions which change according to new requirements for power plants (e.g., fuel economy and low pollution) and new technological advances. A system of objectives is established with three hierarchical levels of decreasing complexity, based on the component objectives relevant to automotive power plants. The system of objectives includes: technical areas (qualitative rating of operability and feasibility of incorporation into the vehicle unit) and ecological areas (conservation of resources and environmental protection). Emphasis is placed on the result of energy conversion rather than on the kind of power plant. Time-dependent weighting functions are used to evaluate individual component objectives with different significance against each other. Ecological considerations in the objective system include the pollutants carbon monoxide, nitrogen oxides, hydrocarbons, and particulates. Demonstration examples of the system analysis are given for the following two alternatives: a gasoline-powered compact car for city and piggy-back traffic (e.g., via railroad) and a diesel engine-powered transporter vehicle for intercity traffic.

45532 **APTIC NO. 68789**

Hoke, R. C., L. A. Ruth, and H. Shaw

COMBUSTION AND DESULFURIZATION OF COAL IN A FLUIDIZED BED OF LIMESTONE. *Preprint, Inst. of Electrical and Electronics Engineers, New York, and American Society of Mechanical Engineers, New York, 9p., 1974. 10 refs. (Presented at the Institute of Electrical and Electronic Engineers-American Society of Mechanical Engineers Joint Power Conference, Miami Beach, Fla., Sept. 15-19, 1974.)*

The combustion and desulfurization of coal in a fluidized bed of limestone was studied as part of an effort to develop an in-situ flue gas desulfurization system for the generation of clean power at low cost. Studies of the coal combustion step were made at pressures up to 9 atm. Sulfur dioxide removal rates of over 90% were measured, and nitric oxide levels were well within the current Environmental Protection Agency standard. The regeneration step was studied at pressures up to 10 atm and temperatures up to 2100 F. The measured SO2 concentration in the product gas from the regenerator averaged about 40-50% of the maximum concentration calculated by assuming the solids and gases were in chemical equilibrium. At 10 atm pressure, the measured SO2 concentration was around 2%. High conversion of calcium sulfate to lime was obtained by adding auxiliary air directly to the fluidized bed. (Author abstract modified)

45533 APTIC NO. 68836

Hollinden, Gerald A., Neal D. Moore, and James J. Schultz

REMOVAL OF SULFUR DIOXIDE FROM STACK GASES BY SCRUBBING WITH LIMESTONE SLURRY: EFFECT OF AN ORGANIC ADDITIVE AT TVA PILOT PLANT. *Louisville Univ., Speed Scientific School, Ky.; International Assoc. for Pollution Control; American Chemical Society, Washington, D. C.; American Inst. of Chemical Engineers, New York; American Inst. of Industrial Engineers, New York; American Society of Civil Engineers, New York; American Society of Mechanical Engineers, New York; American Water Works Assoc., New York; Inst. of Electrical and Electronic Engineers, New York,; and Water Pollution Control Assoc., Environ. Eng. Sci. Conf., Annu. Meet., Louisville, Ky., 1974, p. 205-227. 5 refs. (March 4-5.)*

One of the major long-term problems in the limestone/wet scrubbing process is the disposal of the spent solids (unreacted limestone and sulfur dioxide reaction products). The 550-megawatt limestone/wet scrubbing system planned for Widows Creek unit 8 will produce about 1800 tons (dry basis) per day of spent solids. About 1/2 of the spent solids sent to the disposal pond is unreacted limestone. The excess limestone (normally 1.5 moles of limestone are fed for each mole of SO2 in the inlet flue gas) is required because of the relatively low solubility of the limestone in the scrubbing media. Tests were made at the pilot plant to evaluate the effect upon limestone utilization and SO2 removal efficiency caused by the addition of a chemical additive, benzoic acid. The additive was selected because it is available at a relatively low cost, has a low vapor pressure, and was effective in small-scale tests. The activities of the test program at the Tennessee Valley Authority pilot plant are reviewed. (Author abstract modified)

45534 APTIC NO. 68964

Honma, Keiichi

ROOM ENVIRONMENT INVESTIGATION (PART 3) PERFORMANCE OF DUST COLLECTOR AND INDOOR DUST CONCENTRATION. *(Biru no shitsunai kankyo chosa (Sono 3) jojin sochi no seino to shitsunai hassei fuyu funjinryo). Text in Japanese. Preprint, Japan Society of Architecture, p. 139-140, 1974. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4070.)*

The collecting efficiencies of three types of dust collectors installed in five buildings were measured. Using a low-volume air sampler, samples were collected at air inlet, inlet into return air duct, and cleaned air outlet and were analyzed. The apparent collecting efficiency was in the range of 4.6-89.3%. Also, the apparent concentration of dust produced in rooms was calculated from the difference between the dust concentrations in the air led into rooms and the air at the ventilation outlet. The values obtained at four buildings were in the range of 0.038-0.077 mg/cu m. Significant correlations were found between the apparent dust concentration produced in rooms and the number of persons present in room or floor space per person.

45535 APTIC NO. [illegible]

Horowitz, Joel L.

TRANSPORTATION CONTROLS ARE REALLY NEEDED IN THE AIR CLEANUP FIGHT. *Environ. Sci. Technol., 8(9):800-805, Sept. 1974. 5 refs.*

Because of the importance of the automobile relative to other sources of carbon monoxide, hydrocarbons, and nitrogen oxides, the reduction of automobile emissions is a major objective of programs to improve air quality to meet Federal air quality standards. Since 1968 nationally and 1966 in California, new cars have been subject to increasingly stringent emission standards. As a result, 1974 cars emit only 25% as much CO and HC and 65% as much NOx as pre-1968 cars. Present law requires 1976 cars to emit less than 5% of the CO and HC emitted by pre-1968 cars and 1977 cars to emit only 10% of the NOx emitted by pre-1968 cars. Despite these emission reductions, the new car controls do not reduce automobile emissions enough to achieve and maintain the air quality standards for CO and oxidant in all air quality control regions because of the length of time needed to replace old cars with new ones, the severe pollution of some regions, and growth in automobile use. Additional measures to reduce automobile emissions in air quality control regions which exceed air quality standards include measures that reduce emissions per mile traveled (inspection/maintenance and retrofit) and measures that reduce automobile travel (transit improvements, carpooling, and restrictions on the use of automobiles). These plans, their effect on emissions, and their costs are discussed.

45536 APTIC NO. 66257

Huber, E. W. and K. H. Prescher

REDUCTION OF AIR POLLUTION BY INTERNAL MODIFICATIONS OF A SPARK IGNITION ENGINE. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 5.1-5.11. 9 refs. (Nov. 4-8, Paper 5.)*

Experiments with a single cylinder engine under steady-state conditions were performed to assess the effect of various engine design and operation modifications on the amount of exhaust emission produced. Bowl-type piston chambers gave the lowest hydrocarbon and nitric oxide emissions, while carbon monoxide emissions were practically independent of combustion chamber shape. The only parameter that led to a reduction in both hydrocarbons and nitrogen oxides was the reduction of ignition advance. Compression ratio changes exerted negligible influence on CO concentrations, and reduced compression ratios offered little advantage in the reduction of hydrocarbon or NO concentrations. Hydrocarbon emissions with a fuel injection system were considerably higher than with a carburetor or homogenous mixture device when the mixture was rich; less NO emissions were produced with the injection system. Carbon monoxide was not sensitive to the type of device used for the mixture formation. Changes in valve timing resulted in significant hydrocarbon reductions and slight NO reductions. Carbon monoxide emissions were unchanged after valve-timing modifications.

45537 APTIC NO. 68206

Hurn, R. W.

ALTERNATIVE FUELS – METHANOL. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 34.1-34.11. 2 refs. (Nov. 4-8, Paper 34.)*

Emissions data and fuel economy results from a Bureau of Mines program investigating the use of methanol and methanol-gasoline mixtures as alternative fuels in spark ignition engines are presented. Although attractively low levels of hydrocarbons, carbon monoxide, and nitrogen oxides appear possible from the use of pure methanol, tests with single and multi-cylinder engines indicate that fuel maldistribution problems limit theoretical lean limits. The development of a fuel/air metering and distribution system appears necessary if pure methanol is to be used as a fuel. Tests with methanol-gasoline mixtures indicate that a 20% addition of methanol to gasoline can result in the following emission values for cars over city routes; 15.5 g/mi CO, 2.8 g/mi hydrocarbons, and 3.2 g/mi NOx. Emissions from gasoline during the same testing procedures are: 35.5 g/mi CO, 2.9 g/mi hydrocarbons, and 3.6 g/mi NOx. Possible problems involving the compatibility of methanol with engine and fuel system components include: corrosion, elastometer swelling, and incompatibility with sealing agents.

45538 **APTIC NO. 69831**

Iinoya, Koichi, Kazutaka Makino, Junichi Okutani, and Hiroshi Kawabe

DUST SHAKING PERFORMANCE COMPARISONS FOR BAG FILTER MECHANICAL VIBRATION AND REVERSE CURRENT COLLAPSE TYPE. *(Baggu firuta no kikai shindoshiki to gyakuryu corapusushiki tono haraiotoshi seino no hikaku kento). Text in Japanese. Preprint, Japan Society for Chemical Engineering, p. 100-102, 1974. (Presented at the Japan Society for Chemical Engineering, Hokuriku Meeting, Toyama, Japan, July 17, 1974.)*

Sample dust from a dust generator was supplied to a bag filter of the mechanical shaking or reverse current collapse type. The dust collection was stopped after the pressure loss reached a given value. Dust was then removed from bag filter for a given length of time, and clean air was passed to measure the pressure loss. The operation was repeated until dust on the bag filter could not be removed. The pressure loss was recorded automatically through a D.P. cell, and the dust collected after each operation was weighed. Results showed that optimum continuing time of dust removal existed for the reverse current collapse type, but the dust removal rate decreased with the increase of the continuing time of dust removal for the mechanical shaking type. The mechanical shaking type had a smaller final pressure loss (the pressure loss at which dust can no longer be removed from the bag filter) to the reverse current collapse type.

45539 **APTIC NO. 69173**

Inagaki, Koshiro

THE SIMULTANEOUS TREATMENT PROCESS FOR NITROGEN OXIDES AND SULFUR OXIDES AND CATALYSTS. *(NOx-SOx doji shori purosesu to shokubai). Text in Japanese. (Kagaku Kojo (Chem. Factory), 18(9):31-36, Sept. 1974. 29 refs.*

Most of the simultaneous treatments of nitrogen oxides and sulfur oxides are derived from absorption process. Among them is the ESSO process in which sulfur dioxide, absorbed into magnesium trihydroxide, is converted to insoluble magnesium sulfite and then pyrolyzed to concentrated SO2, allowing concentrated sulfuric acid to be recovered. The NOx is also absorbed into Mg(OH)3 and is converted to magnesium nitrate and nitric oxide, which are converted to ammonium nitrate and magnesium dihydroxide by addition of ammonia. The Tyco process is used for the absorption of NOx and SOx and conversion to concentrated H2SO4, producing nytrosyl bisulfate and violet acid. Since the former is stable in H2SO4, the absorption of H2SO4 is conducted by using H2SO4. In this case some devices are installed so that either water in the exhaust gas is not absorbed into the absorbing solution or it is heated. The temperature must be lowered to maintain good absorption efficiency. Showa Denko K. K. s process and the Kureha- Kawasaki Heavy Industries Ltd. process are discussed as examples of wet catalytic reduction processes in which sodium sulfite is used as the solution to simultaneously absorb SOx and NOx. The former is converted to gypsum, while the latter is reduced to nitrogen by either ammonia or hydrogen. Hitachi Shipbuilding and Engineering Co. Ltd.-Chevron s process is a selective reduction by means of ammonia. Nitric oxide and nitrogen dioxide, in this case, react with ammonia with a D-type catalyst with a space velocity of 2500 to 7000/hr, thus producing nitrogen.

45540 **APTIC NO. 68490**

Inoue, Tatsuo, Hikoroku Honjo, and Nobuo Okimitsu

DEODORIZER PRODUCTION METHOD USING ACTIVATED CARBON AS MAJOR RAW MATERIAL. *(Kasseitan o shu genryo to suru dasshuzai no seizoho). Text in Japanese. (Nissan Kemetoron Shokubai K. K. (Japan)) Japan. Pat. Sho 49-34589. 3p., Sept. 14, 1974. (Appl. Oct. 9, 1968, 1 claim).*

The production method for an air filter for a cooling and heating system consisting of activated charcoal as a primary component is described. The characteristics of the filter board deodorizer described herein are tenacity, low flow resistance, high deodorization efficiency, and durability. To a mixture consisting of 100 parts of activated charcoal, 10 parts of water soluble starch, 3.3 parts of carboxymethylcellulose, 40 parts of alumina sol (10%) or/and silica sol and 13 parts of a substance or substances selected from a group consisting of asbestos, glass fiber, uplp, and crushed scrap paper, 150 parts of water are added, blended, and compression molded into 240 mm times 180 mm times 15 mm board, dried and 6.3 mm holes are made at 15 mm intervals. The results of physical property tests are given.

45541 **APTIC NO. 68971**

Ishii, Akio and Naoaki Ito

INVESTIGATIONS ON AIR PURIFICATION IN CROWDED BUILDING AREAS BY MEANS OF COLLECTIVE HEATING SYSTEMS (2). *(Chiiki shuchu danbo ni yoru biru misshu chiiki no kuki joka ni kansuru chosa kenkyu (sono 2)). Text in Japanese. Preprint, Japan Society of Architecture, Tokyo , p. 165-166, 1974. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4083.)*

Sulfur dioxide emissions from three buildings were monitored for 4 mo, from December through March. In March, the heating systems were converted from coal to city gas, and at the same time, a total of seven buildings, including the aforementioned three, were included in a collective heating system. Sulfur dioxide emission decreased from a high of 10 pphm in December to an average of less than 5 pphm in March. For each of the three buildings, the average sulfur dioxide emissions for March, whether taken for working days, Saturdays, or holidays, remained nearly constant.

45542 **APTIC NO. 68963**

Ishikawa, Kenji, Kenichi Kaino, and Keiai Furukawa

DEVELOPMENT AND PERFORMANCE TEST OF PILOT AIR CLEANING DEVICE. *(Kuki joka sochi no shisaku to sono seino sokutei). Text in Japanese. Preprint, Japan Society of Architecture, p. 137-138, 1974. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4069.)*

Based on air pollution data and indoor environmental standards, the control levels for sulfur dioxide, nitrogen dioxide, dust, bacteria and malodor were determined as basic information for designing. As a result of preliminary test the activated charcoal filter was chosen and an air cleaner consisting of a dust treatment unit, toxic gas pretreatment unit, toxic gas treatment unit, and blower was designed and constructed. The pilot air cleaner with 6000 CMM capacity was installed in a building in Yokohama in Aug. 1973 and tested in Sept. 1973 and Jan. and April 1974. The average removal rates were 80% or higher for sulfur dioxide, 60% for nitrogen dioxide, 65% or higher for dust and 83% for bacteria. The activated charcoal filter was totally ineffective for the removal of carbon monox-

ide (as expected). However, the removal rates of other pollutants were at satisfactory levels.

45543 APTIC NO. 68716

Isoda, Toru

THE DEVELOPMENT OF DUST COLLECTOR FOR THE COMBUSTION SYSTEM (1ST REPORT). CHARACTERISTICS OF FILTRATION IN A BAG FILTER WITH CYCLONE EFFECT. *(Baienyo shujin sochi no kaihatsu (Daiippo) Saikuron koka o riyo shita baggu firuta no shujin tokusei). Text in Japanese. Osaka Furitsu Kogyo Gijutsu Kenkyusho Hokoku (Osaka Prefect. Res. Inst., Ind. Technol. Rep.), no. 63:10-13, July 1974. 1 ref.*

The characteristics of filtration in a bag filter designed with the cyclone effect were determined. Dust collection is efficient at the filtration velocity of 6.0 to approximately 8.0 cm/sec when dust density is high. The bag can be 1/3 to 1/4 smaller than conventional bag filters. The rapping interval can be reduced to 30% at an internal velocity of 10 m/sec using the cyclone effect. This is especially advantageous in high dust density. Pressure drop and specific cake resistance alpha is similar to normal filtration.

45544 APTIC NO. 68479

Itami, Takanori and Shinpei Sato

EXPERIMENTAL STUDY ON CATALYTIC CLEANING OF EXHAUST GASES. *(Shokubai ni yoru haiki seijo ni kansuru jikkenteki kenkyu). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, Tokyo, p. 193-196, 1974. (Presented at the Japan Society of Mechanical Engineers, Nagano District Meeting, Matsumoto, Japan, Oct. 2, 1974, Paper 409.)*

Experimental studies were conducted with catalysts which will reduce amounts of nitrogen oxides (NOx), carbon monoxide (CO), and hydrocarbons (HC). Exhaust gas from a 1958 Toyopet RS engine (1500 cc, 58 HP) was passed through two catalytic converters. The first converter contains a catalyst for NOx, which is deposited on the surface of alumina or copper plates. Nitrogen oxides are broken down into nitrogen and oxygen. The second converter has a catalyst for appropriate CO and HC. Air is introduced into the system just before the second converter, as a second source of oxygen, to cause formation of CO2 and water. These pollutant-free gases are emitted through the tailpipe to the atmosphere. Four types of catalysts were used, containing various amounts of aluminum, aluminum oxide, nickel oxide, copper, manganese and vanadium pentoxide. At 100-250 C, the catalysts were less effective than expected for NOx, but quite effective for CO and HC.

45545 APTIC NO. 68970

Ito, Naoaki and Akio Ishii

INVESTIGATION OF AIR CLEANING IN CROWDED BUILDING AREAS WITH COLLECTIVE HEATING SYSTEM (PART 1). *(Chiiki shuchu danbo ni yoru biru misshu chiiki no kuki joka ni kansuru chosa kenkyu (Sono 1)). Text in Japanese. Preprint, Japan Society of Architecture, p. 163-164, 1974. 3 refs. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4082.)*

In the congested office district in Tokyo, the heating system has been converted from individual heating to collective heating as a pollution control measure. At three measuring points, A (collective heating since March 1973), B (collective heating), and C (individual heating) the sulfur dioxide concentration was measured from Dec. 4, 1972 to March 31, 1973. The data obtained were analyzed in relation to the wind direction frequency distribution and average wind velocity in 16 directions. The SO2 concentration and meteorological factors were not always in agreement, indicating the effect of other factors such as the location of pollutant source and intensity. In the case of A, a decrease in SO2 concentration after the installation of the collective heating system is clearly indicated. The SO2 concentration at C was higher than that at B.

45546 APTIC NO. 69008

Ito, Takusen, Iwao Yanaka, and Hiroshi Iwai

FLARE STACK SMOKE PREVENTION STEAM AUTOMATIC CONTROL DEVICE. *(Fureasutakku no shoen joki jido seigyo sochi). Text in Japanese. (Hitachi Ship Building Co. (Japan)) Japan. Pat. Sho 49-26534. 3p., July 10, 1974. 1 ref. (Appl. March 5, 1970, 1 claim).*

The invention consists of a control system for flare gas from chemical and petrochemical plants with the following characteristics: a flare stack gas duct and a flare burner which is attached to the gas duct; a steam pipe which reaches to the exit of the gas duct; a flare gas flowmeter attached to the gas duct and an amplifier attached to the flowmeter; a continuous gas analyzer attached to the gas duct for the analysis of carbon compounds; a calculator which receives signals from the analyzer and a ratio regulator between the calculator and a steam controller-indicator; and a regulating valve between the controller-indicator and a steam pipe on one side with a steam transporting apparatus between the two on the other side. Carbon compounds and other major components in flare stack gas are analyzed by the continuous gas analyzer and the optimal steam flow rate is calculated. A densitometer can be used to replace the gas analyzer.

45547 APTIC NO. 69010

Iwahashi, Yasuo

DUST TREATMENT METHOD FOR WET DUST COLLECTOR. *(Shisshiki shujin dasuto no shori hoho). Text in Japanese. (Mitsui Metal Industries (Japan)) Japan. Pat. Sho 49-26806. 3p., July 12, 1974. (Appl. Dec. 2, 1970, 1 claim).*

An invention for the treatment of dusts by the addition of lime is described. Lime is added to wet dusts to reduce the adhesion of the dusts. The mixture is concentrated by using a thickener or cyclone followed by dehydration-separation using vacuum filter. Addition of 20 kg of 60% slaked lime to 300 kg of dust significantly improves the efficiency of centrifugal separators or vacuum filters. The optimal quantity of lime depends on the composition and adhesion of dusts, but approximately 5 wt% is most desirable. The method can be used for the treatment of dusts emitted from lead, cadmium, and zinc manufacturers as well as those from non-metal manufacturers. Automatically controlled addition of lime can be employed.

45548 APTIC NO. 68288

Iwai, N., T. Tsuruga, S. Kobayashi, and H. Sudo

THE COMBUSTION OF METHANOL MIXED WITH WATER AS AN ALTERNATIVE FUEL. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 36.1-36.15. (Nov. 4-8, Paper 36.)*

Emission tests and fuel vaporization studies were conducted with test engines from automobiles fueled with methanol-water mixtures. Preliminary bench testing led to the selection of a 0.3 water to methanol ratio. Tests with a commercial four-cylinder (1770 cc) engine equipped with an exhaust catalyst and modified so that the excess air ratio was 1.1 at the water/methanol ratio of 0.3 gave the following 10-mode results: 0.21 g/km hydrocarbons, 0.87 g/km carbon monoxide, and 0.17 g/km nitrogen oxides. The fuel consumption rate was greater than for gasoline, though thermal efficiency was comparable due to the heat of combustion of methanol being half that of gasoline. Some piston corrosion was observed following the tests. Fuel vaporization studies with methanol-water mixtures showed that hydrocarbon emissions increase following a decrease in mixture temperature. Hydrocarbon increases and power decreases were observed at a point where the heat of vaporization of unvaporized fuel reached nearly 5% of the total combustion heat.

45549 **APTIC NO. 68931**

Johnson, R. H. and Colin Wilkes

ENVIRONMENTAL PERFORMANCE OF INDUSTRIAL GAS TURBINES. *Preprint, American Society of Mechanical Engineers, New York, 9p., 1974. 19 refs. (Presented at the American Society of Mechanical Engineers, Gas Turbine Conference and Products Show, Zurich, Switzerland, March 30-April 4, 1974, Paper 74-GT-23.)*

Air pollution from hydrocarbon fuel combustion, both worldwide and local, is discussed by reviewing known measurements of contaminants. Application of gas turbines by industry is one way to provide power needs for attaining and maintaining an industrial society. Environmental performance of industrial gas turbines with respect to exhaust emissions and their environmental impact is presented for oxides of nitrogen, hydrocarbons, carbon monoxide, visible smoke, and particulate matter. Results of recent abatement efforts are also presented together with estimates of potential improvements to show the place of the industrial combustion turbine in a world with growing concern for environmental improvement. Significant advances have been made in recent years for reducing emissions for heavy duty gas turbine engines. It is expected that in the near future, emission levels of heavy duty gas turbines will be reduced to a point that is acceptable to all the regulatory agencies. This will not be achieved, however, without some increase in hardware complexity and cost. (Author abstract modified)

45550 **APTIC NO. 68425**

Johnson, W. R.

BREAKTHROUGHS IN SCRUBBER TECHNOLOGY: GM S INSTALLATION AT ITS PARMA PLANT. *Pollut. Eng. Tech., Proc. Int. Pollut. Eng. Congr., 3rd/1974 Int. Pollut. eng. Expo., Chicago, Ill., 1974, p. 45-51. 5 refs. (Sept., Paper 8.)*

The design and operation of the General Motors double alkali sulfur dioxide scrubbing system at the Chevrolet Parma transmission plant near Cleveland, Ohio are described. The process uses a soluble alkali absorbent (sodium hydroxide) to remove sulfur oxides from the stack gases and an alkaline calcium regenerate (calcium oxide) to remove the absorbed sulfur salts from the spent scrubbing liquor, and simultaneously regenerate the liquor for re-use in the scrubber. The boilers operate at excess air which may be over 100%. The plant has a readily available supply of high sulfur coal and must meet Cleveland s SO_2 emission limitation of 1.0 lb/million Btu. The caustic feed and chemical input and withdrawal must be monitored and controlled. The plant currently burns 55,000 tons of coal/yr. The estimated annual cost of the system is $10/ton of coal. Sulfur dioxide removal efficiency on one scrubber varied from 88% to 92% over a range of scrubber outlet pH of 5.5 to 6.5

45551 **APTIC NO. 68341**

Jones, John F.

CLEAN FUELS FROM COAL FOR POWER GENERATION. *Preprint, American Chemical Society, Washington, D. C., 38p., 1974. 16 refs. (Presented at the American Chemical Society Storch Award Symposium, Atlantic City, N. J., Sept. 11, 1974.)*

The COED process for the production of clean fuels from coal for power generation is described along with accomplishments of a COED pilot plant. The COED pyrolysis process involves the crushing, drying, and heating of coal to successively higher temperatures in a series of fluidized-bed reactors, with a fraction of the volatile matter of the coal being released from each bed. Heat for the process is generated by burning char (obtained from the process) in the last stage and then using hot gases and the hot char in the last stage to heat the other vessels. Volatile products released from the coal in the fluidized-bed reactors pass to a product recovery system for recovering the oil and cooling the gases. Condensation of coal-oil vapors is accomplished by direct contact with a water-rich stream, and the oil phase is dehydrated and filtered to remove solids before being pumped up to pressure and mixed with hydrogen for hydrotreating in a fixed-bed catalytic reactor. Hydrotreating removes sulfur, nitrogen, and oxygen to produce a synthetic crude oil. The gas from the process can be sold as fuel gas or converted to pipeline gas or hydrogen. The residual char can be used as power plant fuel or gasified to produce a fuel gas.

45552 **APTIC NO. 68798**

Joyce, R. S., J. R. Lutchko, R. K. Sinha, and J. E. Urbanic

NEW DEVELOPMENTS IN AMBIENT ODOR CONTROL BY ADSORPTION. *Ann. N. Y. Acad. Sci., vol. 237:389-396, Sept. 27, 1974. 5 refs. (Presented at the Odors: Evaluation, Utilization, and Control Conference, Oct. 1-3, 1973.)*

Adsorption and regeneration tests were performed on activated carbon adsorbers which were equipped with in situ air or stack gas regeneration systems in order to assess the capability of such adsorbers in controlling industrial emission odors, particularly odorous hydrocarbon emissions. Passage of an airstream containing 150 ppm by volume of benzene through a carbon bed at a linear velocity of 60 ft/min (7700 bed volumes/hr) resulted in essentially complete benzene removal after 24 hr, with the carbon having adsorbed 18% of its weight of benzene. Passing air through the bed in an upflow direction at a linear velocity of 6 ft/min (770 bed volumes /hr) at a temperature of 400 F for 1 hr removed 92% of the adsorbed benzene. Successful adsorption and regeneration results were also obtained with paint solvents containing various aromatic hydrocarbons. The activated carbon adsorber equipped with air or stack gas regeneration appears to be a practical method for the control of odors from many industrial installations and can effectively concentrate the vapors to the range in which incineration or an alternate destruction or recovery route can effectively be used. Preliminary indications are that the carbon will have a practical economic life; in cases where the capacity diminishes with time in cyclic operation to an impractically low level, auxiliary procedures such as vacuum or high-temperature thermal reactivation in an external furnace can be used at intervals. Air regeneration is impractical for vapors that are unstable on carbon in the presence of air or for materials that tend to polymerized.

45553 **APTIC NO. 68592**

Kadlec, Robert H., Everett A. Sondreal, Donald J. Patterson, and Marshall W. Graves, Jr.

LIMITING FACTORS ON STEADY-STATE THERMAL REACTOR PERFORMANCE. *Preprint, Society of Automotive Engineers, New York, 15p., 1974. 16 refs. (Presented at the Society of Automotive Engineers International Automotive Engineering Congress, Detroit, Mich., Jan. 8-12, 1973.)*

Limiting factors on steady-state thermal reactor performance were investigated using a Chevrolet 350 cu in. engine and a Du Pont model V reactor. Carbon monoxide emissions were a function of the amount of injected air, and otpimum CO reduction occurred in the air injection fraction range of 0.15-0.4 and produced a reactor centerline temperature of about 1550 F. Aldehydes which were about 50 ppm without air injection rose five-fold with small quantities of injected air; they fell to 20 ppm in the range of air injection where CO and hydrocarbon oxidation was optimized and rose nearly ten-fold to 460 ppm with excessive air injection. Considering the blending of multiple cyclic inputs which characterizes the exhaust reactor problem, failure to approach complete conversion at a high temperature stationary state depended strongly on both the pattern of flow and the number of coalescences occurring per unit of residence frequency. Simulation runs indicated three basic limitations on conversion due to mixing: departure of reactants from the reactor prior to cell-wise mixing due to insufficient micromixing intensity, lack of sufficient backmixing to blend maltimed input of air and exhaust, and lack of sufficient backmixing to bring a low-temperature fraction of exhaust up to reaction temperature irrespective of timing of air injection.

45554 **APTIC NO. 69857**

Kanno, Kozo

PURIFICATION OF INDUSTRIAL FLUE GAS. (DUST COLLECTION APPARATUS). *(Kogyo haigasu no joka ni tsuite (shu to shite shujin sochi ni tsuite). Text in Japanese. Nenryo oyobi Nensho (Fuel and Combustion), 41(6):1-15, 1974. 4 refs.*

Considerations in selecting dust collection systems, the present state of electrostatic precipitators, a comparison of electrostatic precipitators and other types of collectors, the problems of precipitators and countermeasures, the new ultra high voltage-wide spaced electrodes precipitators, and future projects are discussed. In selecting a dust collection system, the following factors limit the choice: particle size distributions, the viscosity of the dusts, the dust quantity in the gas, the physical and chemical composition of the dusts, dust electrical resistance, the gas temperature, formation processes and the operating conditions of the dust producing system, the dew point and corrosiveness of the dusts, economic considerations, and collection efficiency and operating costs. With the presently available electrostatic precipitators, the collection of less than 1 micron mist type particles is still imperfect. The electrical resistance of dusts also impairs the proper function of the precipitator. This can be improved to a certain extent by jet spraying the gas with water or steam to increase steam partial pressure in the gas. In this case, the gas should not be less than 100 C in temperature. In the case of corrosive gases, the dew point must be monitored. The addition of sulfur trioxide or ammonia can also lower electrical resistance. The recently developed wide space electrodes (500-900 mm) can be effective if the dust resistance is not extremely high.

45555 **APTIC NO. 68571**

Karim, G. A. and S. Khanna

THE EFFECT OF VERY LOW AIR INTAKE TEMPERATURE ON THE PERFORMANCE AND EXHAUST EMISSION CHARACTERISTICS OF A DIESEL ENGINE. *Preprint, Society of Automotive Engineers, Inc., Warrendale, Pa., 8p., 1974. 5 refs. (Presented at the Society of Automotive Engineers National Combined Farm, Construction, and Industrial Machinery and Powerplant Meetings, Milwaukee, Wis., Sept. 9-12, 1974, Paper 740718.)*

Operational and exhaust emission characteristics of a single cylinder direct injection diesel engine are described. It was operated warm under a wide range of intake air temperatures extending down to -45 F and occasionally -60 F. The smoke density increased at the very low load range mainly associated with the greater production of aerosol or cold smoke. At lower intake temperature, this increase at light load and partial motoring range became particularly high despite the increased mass of air being induced. For the low load range, the exhaust was almost totally opaque at subzero temperatures. The concentration of carbon monoxide under very light load or partially motored conditions associated with cold or aerosol smoke emissions was many times that observed for the same engine at higher loads. The nitrogen oxides exhaust emission for any fueling rate decreased significantly with the reduction of intake temperature. The concentration of nonutilized oxygen in the exhaust gas for any fueling rate, increased with the lowering of intake temperature, reflecting the deterioration of fuel utilization and increased mass flow such a reduction of temperature.

45556 **APTIC NO. 69000**

Kautz, Johannes

WET ELECTROSTATIC PRECIPITATORS. *(Nassarbeitende Elektroentstauber). Text in German. Staub, Reinhaltung Luft, 34(10):356-357, 1974.*

In wet electrostatic precipitators, the dust is separated by forces of the electric field on wet collection electrodes. This has the advantage that the atmosphere in the filter is saturated with water vapor. The electric dust resistance, be it high or low, plays no role. All dusts can be separated, with the exception of dusts tending to cement together or to start foaming. Compared to wet scrubbers, wet electrostatic precipitators consume less power. They are used for separation of all dusts with high electrical resistance such as brown smoke and with low electrical resistance such as soot. Briefly, wet electrostatic precipitators are applied whenever fine, aggressive, and toxic dusts are to be separated with high efficiency. The collection electrodes either have the shape of plates or of tubes. Plate-type collection electrodes may be arranged horizontally or vertically. Tubular collection electrodes are only for vertical installation. Since with larger electrode distances less collection area per volume unit of gas is needed, tubular electrodes with diameters between 0.5 and 1 m and lengths between 10 and 15 m are being built. Voltages between 100 and 200 KV are used.

45557 **APTIC NO. 68917**

Kehres, John K. and John J. Allan, III.

EXHAUST POLLUTION MINIMIZATION IN SMALL ENGINES USING ADAPTIVE DIGITAL CONTROL. *Preprint, Society of Automotive Engineers, Inc., New York, 8p., 1974. 5 refs. (Presented at the Society of Automotive Engineers, National Combined Farm, Construction and Industrial Machinery and Fuels and Lubricants Meetings, Milwaukee, Wis., Sept. 10-13, 1973, Paper 730858.)*

Laboratory test results are reported from experiments using an adaptive digital control system on an 8 hp, 4-cycle gasoline engine with fuel injection for the purpose of minimizing carbon monoxide and hydrocarbon emissions. A pulse generator operating at one-half crankshaft speed sends a signal to the computer at a specified time in each cycle; and the computer, upon acknowledging the signal, reads the intake manifold pressure from which the mass of air inducted in the current cycle can be computed. Using a precomputed air-fuel ratio, the feedback variables, and the computed air mass, the required mass of fuel to be injected is computed, with the fuel injector being opened for the length of time which corresponds to the computed figure. The adaptive elements of the system update the air-fuel ratio for use in subsequent cycles following fuel injection at each cycle. Carbon monoxide production is held to less than 0.3% and hydrocarbons to less than 600 ppm on the injected engine. The controller can limit the CO production of the engine to less than 0.5% and still maintain 80% of the maximum torque output.

45558 **APTIC NO. 66375**

Keith, Carl D. and John J. Mooney

PROCESS AND APPARATUS. *(Engelhard Minerals and Chemicals Corp., Murry Hill, N. J.) U. S. Pat. 3,791,143. 8p., Feb. 12, 1974. 7 refs. (Appl. Nov. 10, 1971, 20 claims).*

A catalytic oxidation device for reducing hydrcarbon and carbon monoxide emissions from automotive internal combustion engines is described which is more effective than prior art catalyst systems during cold engine start-up. The system employs several catalytic zones, with an initial catalyst zone being preferably in a separate vessel positioned near the engine manifold. Supplemental fuel is charged to the initial catalyst at least during engine start-up. Subsequent to engine start-up, the exhaust gases may be bypassed around the initial catalyst zone and into a following catalyst zone which has been heated during the start-up period by gases passing from the intial catalyst zone. The supplemental fuel addition may be stopped after a predetermined time from the beginning of engine operation. A preferred supplemental fuel is methanol, and the preferred catalysts are of the honeycomb type. (Author abstract modified)

45559 **APTIC NO. 68373**

Kinoshita, Keijiro

DEVELOPMENT OF THE NISSAN GAS TURBINE. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 20.1-20.30. 1 ref. (Nov. 4-8, Paper 20.)*

Engine developments and exhaust emission control studies are reviewed for a Nissan gas turbine engine which employs a closed loop turbine inlet temperature control system in the fuel control mechanism. Results from the California 13-mode emission test for heavy duty vehicles are as follows: carbon monoxide, 5.1 g/PS-hr; unburned hydrocarbons plus nitrogen oxides, 4.9 g/PS-hr. These values easily meet the 1975 California standards of 25 and 10 g/PS-hr, respectively. Tests with fuels other than kerosene indicate that NOx emissions are reduced fivefold with methanol fuel, though hydrocarbons and CO are greatly increased. Kerosene-water emulsions and mixtures of oil, kerosene, water, and methanol give higher NOx emissions even when CO and hydrocarbon control is loosened. A new combustor with an ultra lean primary combustion zone in which fuel and air are pre-mixed and burned to achieve lean homogenous combustion is currently under development.

45560 **APTIC NO. 68966**

Kobayashi, Masahiro, Eiji Miyaji, and Yoshinobu Suzuki

AIR CLEANING PLAN OF OFFICE BUILDING (PART 3) INDOOR ENVIRONMENT AFTER CLEANING. *(Jimusho biru no kuki joka keikaku (Sono 3) Joka go no ishitsunai kuki kankyo). Text in Japanese. Preprint, Japan Society of Architecture, p. 155-156, 1974. 3 refs. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4078.)*

The operational records of central duct type air cleaning and conditioning systems installed at three buildings in Tokyo were evaluated. The efficiency of the system was evaluated based on the difference in outdoor and indoor pollutant concentrations. The sulfur dioxide concentration after the installation of the system showed a considerable decrease, and was maintained at a fairly constant level regardless of the outdoor SO2 concentration. The comparison of data obtained in July 1973 and April 1974 indicates the durability of the filter without much deterioration in efficiency. The nitrogen dioxide concentration measured by a similar method indicated lower removal efficiency compared to the case of SO2. The durability of filter is longer than the 6-12 mo specified by the manufacturer as far as SO2 is concerned. In the case of NO2, however, it seems to be suitable to change filters every 6-12 mo in order to maintain initial efficiency for NO2 removal. As for the nitric oxide, the indoor NO concentration was higher than that of outdoor concentration which was attributable to a considerable amount of NO2 and NO produced by smoking. The filter used in the present system is inadequate for NO removal.

45561 **APTIC NO. 68950**

Koyama, Yoshimasa

NEUTRALIZERS AND THEIR BAD ODOR REMOVAL EFFECTS. *(Chuwazai to akushu no bojo koka). Text in Japanese. Preprint, Osaka Technical Assoc. (Japan) and Japan Burner Research Assoc. 17p., 1974. 4 refs. (Presented at the Seminar on Bad Odor Control Tecniques, 2nd, Osaka, Japan, 1974.)*

The perception threshold, the identification threshold, odor concentration and sensitivity intensity, the definition of odor neutralization, the methods of neutralizer usage, the effects of spray deodorization, the measurement of deodorization effects by an odor threshold meter, and the use of cycloifactor are discussed. The difference between masking and neutralization is that the former is the creation of a stronger odor by mixing, the latter is the creation of a less intense odor by mixing the existing bad odor with another. Odors that have neutralizing effects include iodoform and almond oil; musk and strong almond oil; wax and peru balsam; benzene and rubber; and camphor and eau de toilet. A cycloifactor is a simple manual odor meter with which dilution of test air (odorous air) is achieved manually. By varying the concentration, the perception threshold, the identification threshold, and the no-odor-point are digitally recorded. The system comprises the following process: air sampling, the first dilution, the second dilution (both by supplying fresh air), flow monitoring, and recording on a digital meter.

45562 **APTIC NO. 68470**

Kuniyo, Yoshinobu

DECOMPOSITION AND REMOVAL OF LOWER BROMINATED HYDROCARBONS. *(Shusoka teikyu tanka suiso no bunkai jokyo hoho). Text in Japanese. (Asahi Garasu K. K. (Japan)) Japan. Pat. Sho 49-34896. 4p., Sept. 18, 1974. 1 ref. (Appl. Oct. 8, 1969, 1 claim).*

The removal method for lower brominated hydrocarbons contained in fumigation exhaust gas is described. The lower brominated hydrocarbons are decomposed efficiently into hydrogen bromide or bromine by heating at temperatures below 500 C (preferably 100-400 C) in the presence of porous solid such as activated charcoal, silica gel, alumina gel, molecular sieves, activated bauxite, and porous solid containing aluminum oxide or silicon dioxide as a primary component or these porous solids carrying heavy metals. The decomposition products such as HBr and Br2 are then removed readily from exhaust gas by washing with water or alkaline solutions. The exhaust gas containing lower brominated hydrocarbons is passed through a catalytic decomposition tower packed with porous solid maintained at a given temperature. The decomposition rate of methyl bromide was in the range of 11.0% - 84.0% depending on the type of porous solid and decomposition temperature.

45563 **APTIC NO. 69013**

Kurosawa, Keiji

EXHAUST GAS DESULFURIZATION BY THE CM PROCESS. *(CM-shiki haien datsuryu ni tsuite). Text in Japanese. Sekko to Sekkai (Gypsum Lime), no. 132:195-200, 1974.*

The characteristics of a CM-type exhaust gas desulfurizer are outlined. Either slaked lime or pulverized limestone is used as an absorbent. In the absorbing tower the space velocity is 5 m/sec, (twice as large as that of any other type) and the gas-liquid contact efficiency is excellent. No adhesion takes place even when the absorbing solution is slurry, since the walls are washed with a large quantity of the absorbing solution. The CM-type desulfurizer is capable of maintaining the amount of residual sulfur dioxide in exhaust gas to be treated below 50 ppm and the operating performance remains constant enough to meet any fluctuations. The absorbing efficiency is not reduced even when the amount of flowing gas is reduced to the 1/4 of the normal amount. The operating system is described. Cooling of gas with the recycling water precedes its entry into the absorbing tower. The pH of the absorbing solution is controlled in the primary absorption. In the secondary absorption the pH value is kept between 6 and 6.8 and it is feasible to reduce the SO2 concentration in the outlet by raising the pH value of the absorbing solution.

45564 **APTIC NO. 68466**

Kuzmin, M. S. and E. I. Polyakov

AIR-JET COVERS OF NOXIOUS EMANATION SOURCES. *(Vodzushno-strynyye ukrytiya istochikov vrednykh vydeleniy). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, no. 7:15-19, 1974.*

Theoretical prequisites and experimental results from kinematic and dynamic studies of annular and double slot-parallel air-jet covers designed for eliminating noxius indoor pollutants are presented. Formulas are derived for linking the basic parameters of jet currents, and these formulas are in turn reduced to a form convenient for engineering calculations. The air jet covers permit the removal of noxious indoor pollutants via exhaust ventilation in a manner such that the ventilation inlets can be arranged at a considerable distance from the pollutant source. Installation of an air jet cover designed according to the mathematical formulas derived appreciably improved working conditions in one shop.

45565 **APTIC NO. 68569**

Kyan, Chwan Pein

DETERMINATION OF OPTIMAL AIR POLLUTION CONTROL STRATEGIES. *California Inst. of Tech., Pasadena, Calif., Dept. of Chemical Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1974, 215p. 77 refs.*

A general theoretical framework for the determination of optimal air pollution strategies is presented for both long-term and real-time controls. Emission control procedures are assumed to change on a year-to-year basis for the long term controls, and the problem considered is to determine the set of control measures that minimizes the total cost of control while maintaining specified levels of air quality each year. Computational methods are developed based on mathematical programming techniques and are applied to the evaluation of long-term air pollution control strategies for the Los Angeles basin. Optimal strategies are obtained for the control of carbon monoxide, nitrogen dioxide, and ozone for 1973-1975 in the Los Angeles basin. A computational algorithm is also developed for solving the class of control problems that exist for real time control which is based on meteorological predictions made over a several-hour to several day period. Typical control measures include restrictions on the number of motor vehicles allowed on a freeway, reduced operation of power plants, and substitution of low emission fuel (e.g., natural gas) for high emission fuel (e.g., coal) in power plants. The strategy for each time can be determined by an air pollution control agency by means of a computer implementing the algorithm presented. (Author abstract modified)

45566 **APTIC NO. 68266**

Lange, Karlheinz, and Dusan Gruden

COMBUSTION AND EXHAUST EMISSION IN A MOTOR WITH THE PORSCHE STRATIFIED-CHARGE SYSTEM. *(Verbrennungsablauf und Abgasemission in einem Motor mit dem Porsche-Schichtlade-Kammer-System). Text in German. Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 13.1-13.11. (Nov. 4-8, Paper 13.)*

A low-emission stratified-charge engine developed by Porsche, West Germany, is described. Stable ignition and combustion in the main chamber is ensured by the high concentration of partially oxidized products, such as carbon monoxide, hydrogen, and radicals formed in the ignition chamber even at air-excess coefficients below 1. The exhaust gas has the same composition as that of conventional engines. In a model originally designed for reduced nitric oxide emission, it was possible to reduce the NO emission by 90%. The hydrocarbon emission was also reduced. The carbon monoxide emission was in the same order of magnitude as that from a conventional engine operated on lean mixtures. A slight increase of the originally very low NO emission permitted the hydrocarbon emission and the fuel consumption to be reduced. When the stratified-charge motor was operated on methanol, reduction of the CO emission by 50-70% and nearly complete elimination of the NO emission was observed.

45567 **APTIC NO. 68279**

Lapedes, D. E. and J. Meltzer

STATUS REVIEW OF HYBRID HEAT ENGINE/BATTERY AND HEAT ENGINE/ FLYWHEEL VEHICLES. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 27.1-27.11. (Nov. 4-8, Paper 27.)*

The status of hybrid heat engine/battery and heat engine/flywheel vehicle development under the Environmental Protection Agency's Alternative Automotive Power Systems Program is reviewed. A hybrid heat engine/battery system consisting of a Stirling engine and lead acid batteries installed in a Chevrolet Vega results in reductions of hydrocarbon and nitrogen oxide emissions of 34-73% and 15-80% of the federal 1976 standards. Carbon monoxide standards are however, exceeded by the hybrid. A comparative analysis of heat engine emissions for a hybrid flywheel drive contrasted with a conventional three-speed automatic transmission shows that without a catalyst the flywheel drive offers hydrocarbon, CO, and NOx reductions. Hydrocarbon and CO emissions are equivalent for hybrid and conventional drives with a catalyst. Flywheel drive offers a significant reduction only for NOx emissions. Preliminary studies indicate that although the hybrid vehicle is technically feasible, it is a complex and costly system when configured to match the performance of conventional internal combustion engine-powered vehicles.

45568 **APTIC NO. 68504**

Larson, Dennis M.

ACTIVATED CARBON ADSORPTION FOR SOLVENT RECOVERY IN VAPOR DEGREASING. *Metal Finishing, 72(10):42-45, Oct. 1974. 3 refs.*

Activated carbon adsorption equipment plays a role in all phases of solvent usage in vapor degreasing, including pollution control, safety, and economics. Solvent standards in industrial air are 100 ppm perchloroethylene, 100 ppm trichloroethylene, 350 ppm 1,1,1 trichloroethane, 500 ppm methylene chloride, 750 ppm Freon TMC, and 1000 ppm Freon TF. Most degreasing operations, if operated by accepted degreasing standards and properly vented, conform to these standards. Some degreasing operations, however, exceed these standards because of poor operation, poor degreaser maintenance, or excessive solvent dragout. Pollution control regulations and standards also require strict control of chlorinated solvents. Activated carbon adsorption systems play a large role in eliminating air pollution, insuring proper ventilation in work areas for worker safety, and reducing operating costs by reclaiming solvents normally discharged to the atmosphere. A properly sized carbon adsorption system installed on the vapor degreaser will clean the air of 98% of the solvent vapors. If the degreasers are properly operated, solvent savings consistently above 85% can be expected. The two main functions of a carbon adsorption system are that of collection and cleaning, referred to as adsorption and desorption. At the end of the adsorption period the carbon adsorption system will automatically cycle itself, rotating one bed off adsorption and into a cleaning cycle where the carbon is desorbed or regenerated. The three major degreaser designs which must be considered in the design of adsorption systems are open pit, cross rod, and monorail degreasers.

45569 **APTIC NO. 68457**

Lieberman, William

ENVIRONMENTAL IMPLICATIONS OF AUTOMOBILE-FREE ZONES. *Air Qual. Environ. Factors, no. 492:17-26, 1974. 14 refs.*

The effectiveness of automobile free zones (AFZ) in reducing environmental damage by automobiles is discussed. Carbon monoxide levels with AFZ were reduced in Gothenburg

(Sweden) from 30 to 5 ppm; in Marseilles from 18.8 to 3.6 ppm; in New York from 23 to under 9 ppm, in Tokyo from 2.5 to 2.1 ppm; and in Vienna from 7.4 to 4.1 ppm. An analytical procedure was developed to assess the external effects of AFZ: compare trips to a target area, with and without the AFZ, and convert the trip information into pollution emission data. Although the relationship between AFZ and nonautomobile models is not certain, these modes may conserve more energy than automobiles and emit lower levels of CO, hydrocarbons, nitrogen oxides, sulfate, and particulates. Area wide environmental problems can be reduced if AFZ are centrally located in relation to market areas and transit systems; if provisions are made to handle rerouted traffic; and if the use of nonautomobile modes to AFZ is encouraged. (Author abstract modified)

45570 **APTIC NO. 68261**

Linder, E., H. Jahnke, R. Latsch, K. Neidhard, and D. Scherenberg

MINIMIZATION OF EXHAUST EMISSIONS OF SI-ENGINES; INTERRELATING EFFECTS OF AIR/FUEL-RATIO, MIXTURE PREPARATION, IGNITION, EGR AND THERMAL AND CATALYTIC TREATMENT OF EXHAUST GAS. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 8.1-8.9. 10 refs. (Nov. 4-8, Paper 8.)*

The effects of air-fuel ratio, mixture preparation, ignition timing, and engine design modifications on exhaust emissions from internal combustion engines are discussed along with the development of a nitrogen oxides sensor for monitoring thermal and catalytic afterburners and exhaust gas recirculation systems. Starting and warm-up enrichment can be reduced considerably by the use of vaporized fuel, resulting in reduced hydrocarbon and carbon monoxide emissions. A family of characteristic curves for optimizing ignition timing and air/fuel ratio indicate 40% reductions in hydrocarbon emissions and 25% nitric oxide reductions with a fuel consumption disadvantage of about 4%. Turbulence chamber engines result in much leaner misfire limits and allow a lower NO value to be obtained in comparison with standard engines. A sensor which incorporates a reducing catalyst electrode as part of an electrochemical cell is described that has a diffusion limiting current directly proportional to the concentration of nitrogen dioxide. The sensor is proposed for nitrogen oxide monitoring, though oxidation of NO to NO2 is still a problem that requires more investigation.

45571 **APTIC NO. 68743**

Loboda, A. I., V. A. Mikhaylov, B. N. Rebristyy, A. D. Mal tsev, and A. E. Vasil ev

CONDITION AND IMPROVEMENT OF THE AIR OF OPEN-CUT MINES DURING OPERATION OF MINING MACHINES. *(Sostoyaniye i puti uluchsheniya atmosfery kar erov pri rabote gornykh mashin). Text in Russian. Gorn. Zh., 150(3):72-75, 1974. 3 refs.*

The presence of unacceptably high concentrations of toxic gases as generated by flame drills and diesel engines in an open-cut mine prompted studies on the abatement of toxic gas emissions during the operation of such mining machines. As neither ventilation nor air conditioning of the operator s cabin were effective, the effect of additives and fuel modification on the toxic emissions was studied. Manganese cyclopentadienyl tricarbonyl added to the diesel fuel reduced the carbon monoxide, nitrogen oxides, and soot formation, but caused caking. The application of a high-potential field to the flame and of a magnetic field to the fuel considerably reduced the nitrogen oxides and aldehydes emissions. Steam added to the combustion air reduced the CO emission by 71.3%, the NOx emission by 89.1%, and the aldehyde emission by 20%. Water injected into the cylinder had a similar effect. When water in diesel oil emulsion was added to the diesel fuel at a rate of 10% water, the reductions in the CO, NOx, aldehyde, and soot emissions were 47%, 58.5%, 35%, and 85.3%, respectively. Emulsions prepared by an ultrasonic technique were most efficient.

45572 **APTIC NO. 68712**

Lowe, Roy E.

LOW-POLLUTION TRASH INCINERATOR. *(Assignee not given.) U. S. Pat. 3,799,077. 10p., March 26, 1974. 5 refs. (Appl. April 5, 1973, 51 claims).*

A trash incinerator which reduces the emission of combustion products is designed to be readily operable by unskilled persons, to protect persons charging the incinerator with waste material from intense heat, and to be economically assembled, with substantially no maintenance requirements. The apparatus consists of a combustion chamber connected to a flue and a blower with an inlet connected with the flue and an air inlet. The outlet of the blower is connected to a discharge manifold within the combustion chamber for recirculating a portion of the partially burned combustion products through the chamber. The outlet of the blower can also be connected to a manifold to provide a stream of air retarding the escape of hot gases through an opening in the combustion chamber, thereby protecting persons charging waste material into the chamber through the opening. (Author abstract modified)

45573 **APTIC NO. 68965**

Lu, Tsun Min, Keiai Furukawa, and Koyo Maekawa

EFFECT OF HEAVY METAL AIR POLLUTION ON INDOOR ENVIRONMENT (PART 1) REMOVAL OF HEAVY METAL POLLUTANTS BY AIR CLEANING APPARATUS. *(Jukinzoku taiki osen no shitsunai kankyo ni oyobosu eikyo (Sono 1) jukinzoku osen busshitsu no kuki joka sochi ni yoru jokyo seino ni tsuite). Text in Japanese. Preprint, Japan Society of Architecture, p. 141-142, 1974. 4 refs. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4071.)*

The removal efficiency of heavy metal pollutants by the existing air cleaning system was investigated. An air cleaner equipped with a high efficiency filter for collecting suspended particulates and an activated charcoal filter for gaseous pollutants installed in a building in front of the Yokohama station with heavy traffic and the near-by Keihin industrial area was chosen for the investigation. The iron, zinc, manganese, lead, cadmium, nickel, and copper concentrations in air samples collected before and after passing through the air cleaner were measured in Aug. 1973 and in Jan. and April 1974. The removal rate of Fe and Zn varied with the variation in outdoor air. The removal rate of Pb and Cd showed a similar tendency to that of suspended particulates, and that of Mn was high with little variation. However, this particular type of air cleaner was useless for the removal of Ni. For Cu, the concentration in cleaned air is higher, and the cause for this phenomenon is to be investigated. The removal rate of individual heavy metals varies with the variation in outdoor pollutant concentration. Therefore the evaluation of suspended particulates pollution by weight alone is insufficient, and the composition of suspended particulates should be taken into consideration.

45574 **APTIC NO. 68659**

Maruyama, Hideaki

FLEXICOKER METHOD FOR THE DESULFURIZATION OF HEAVY OIL. *(Juyu datsuryu ni taisuru Flexicoker-ho). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 41(7):628-634, July 1974.*

Flexicoking is the combination of fluid coking and the conversion of coke into gases. Flexicoking of a sample oil, collected at 1050 F at the bottom of a distillation tower under reduced pressure gave 1.4 wt% hydrogen sulfide, 6.7 hygrogen, 46.9

light oil, 11.7 coker naphtha, and other compounds. The conversion of coke into gas resulted in a product consisting of 22 mole% carbon monoxide, 8 carbon dioxide, 8 hydrogen, and 59 nitrogen. The heat of combustion of this gas was about 1000 kcal/cu Nm. Desulfurization by the flexicoker method was more economical than other methods such as direct and indirect desulfurization especially when the sulfur content of fuel oil was low. Nitrogen was also effectively removed. In an example, about 90% nitrogen was removed from an oil collected at the bottom of a normal pressure distillation tower when the oil was treated with distillation under reduced pressure, flexicoking, and then with desulfurization by hydrogenation of gas oil. Control systems of flexicoking apparatus and the flexicoking system in an automobile gasoline production plant and a plant where substitute natural gas is produced are described. The history and practical data of fluid cokers are also discussed.

45575 APTIC NO. 68027

Matsuki, Masakatsu, Tadao Torisaki, and Kiyoto Miyazawa

RECENT STATUS ON DEVELOPMENT OF THE TURBOFAN ENGINE IN JAPAN. *Preprint, American Society of Mechanical Engineers, New York, 12p., 1974. (Presented at the American Society of Mechanical Engineers, Gas Turbine Conference and Products Show, Zurich, Switzerland, March 30-April 4, 1974, Paper 74-GT-39.)*

Efforts to design and evelop new jet engines have been made in Japan since 1953. One family of propulsion engine (J3) succeeded in getting into production to be installed on two models of Japanese developed aircraft (T1B and P2J). Another family of lift engine (JR) has been successfully used for overall VTOL system studies. Based on these experiences, studies on a new fan engine for main propulsion are being carried out. This new engine (FJR-710) is a high bypass front engine developed for low noise generation and low smoke emission. The interim goal for the engine is an exhaust smoke density below AIA 25. A combustor of the air-swirl atomizer type has been adopted which can successfully reduce smoke. (Author abstract modified)

45576 APTIC NO. 68837

McKenna, John D.

THE APPLICATION OF FABRIC FILTER DUST COLLECTORS TO COAL FIRED BOILERS. *Louisville Univ., Speed Scientific School, Ky.; International Assoc. for Pollution Control; American Chemical Society, Washington, D. C.; American Inst. of Chemical Engineers, New York; American Inst. of Industrial Engineers, New York; American Society of Civil Engineers, New York; American Society of Mechanical Engineers, New York; American Water Works Assoc., New York; Inst. of Electrical and Electronic Engineers, New York; and Water Pollution Control Assoc., Environ. Eng. Sci. Conf., Annu. Meet., Louisville, Ky., 1974, p. 257-273. 6 refs. (March 4-5.)*

The feasibility of applying fabric filter dust collection to industrial size coal-fired boilers was studied. A fabric filter pilot plant was installed on a slip stream of a stoker boiler stack. The screening of a number of filter bag materials was included in the study. Preliminary results are presented for Nomex felt, Teflon felt, Dralon T felt, and Gore-Tex laminate on Nomex backing filters. The economic feasibility of the various filters is also discussed.

45577 APTIC NO. 68275

McLean, A. F.

THE ARPA/FORD ALL CERAMIC TURBINE DEVELOPMENT PROGRAM. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 22.1-22.11. 9 refs. (Nov. 4-8, Paper 22.)*

An Advanced Research Project Agency/Ford research program designed to develop materials, fabrication processes, and designs for application of ceramics to vehicular, high-temperature gas turbine engines is described. The objective of the program is to raise the temperature at the turbine inlet of a ceramic engine to 1370 C compared with 980-1035 C for present uncooled metal engines; a temperature rise of this magnitude allows for 20-30% improvement in efficiency at full power and even greater efficiency improvements at less than full power. The development phase of stationary ceramic components is completed, including a 50-hour engine test. Ceramic turbine rotors are through the design phase and currently in the phase of fabrication development and initial component testing. Some of the problems of fabricating a duo-density silicon nitride turbine rotor are defined and are being tackled. Inspection of the ceramic components after a 50-hour cyclic durability test of a high temperature gas turbine engine using metal turbine rotors and a complete set of ceramic stationary flow path components revealed that all of the parts except the second stage stator were crack-free. Turbine inlet temperature was automatically controlled to a flat steady-state schedule of 1050 C.

45578 APTIC NO. 68248

Meijer, R. J. and C. L. Spigt

THE POTENTIAL OF THE PHILIPS STIRLING ENGINE FOR POLLUTION REDUCTION AND ENERGY CONSERVATION. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 1-12. 6 refs. (Nov. 4-8.)*

The potential of the Philips Stirling engine, formerly known as the hot-air engine, for pollution reduction and energy conservation is discussed. The Stirling engine is a piston engine based on a closed cycle system, converting heat into mechanical power. Part of the engine is kept at a high temperature (approximately 750 C) by supplying heat continuously to the system through the wall of a heat exchanger, while another part of the engine is kept at a lower temperature by extracting heat from the system through the walls of another heat exchanger. Power is produced by a compression of the working gas at low temperature and an expansion at high temperature. Simulation tests with a burner sized for a 170 brake horsepower Ford Torino vehicle indicate that the engine easily meets 1977 American emission levels. Emission projections for unburned hydrocarbons, carbon monoxide, and nitrogen oxides are: 0.2, 1.20, and 0.14 g/mi. As an example of the variety of external heating possibilities which exist for the engine (including a variety of liquid and gaseous fuels), stationary heat stations are cited as a possibility. Laboratory tests indicate that a zero pollution city car equipped with a heat storage device can have very acceptable range and drivability characteristics.

45579 APTIC NO. 68251

Metz, N. and W. Mueller

REDUCING SOOT EMISSION FROM DIESEL ENGINES BY EXHAUST AFTERBURNING. PROPERTIES AND MEASUREMENT OF SOOT. *(Russreduzierung bei Dieselmotoren durch Abgasnachbehandlung. Russbeschaffenheit und messtechnische Erfassung). Text in German. Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. A 2.1.1- A 2.1.9. (Nov. 4-8, Paper A 2.1.)*

The use of afterburning for reducing soot emissions from diesel engines is discussed along with information concerning the properties and composition of soot and their measurement. Soot quantity measurements and soot particle size distributions are considered, and the origin of soot formation in the diesel engine is discussed. Soot afterburning with a regenerative heat exchanger is proposed as the most promising method of soot control for diesels. The heat exchanger is described and depicted diagramatically.

45580 **APTIC NO. 68291**

Michel, A., W. Frie, H. -J. Henkel, H. Kostka, W. Kuesebauch, B. Paul, and E. von Szabo

COMPACT GAS GENERATOR FOR THE ECONOMIC OPERATION OF INTERNAL COMBUSTION ENGINES WITH LOW POLLUTANT EMISSION. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 40.1-40.7. 7 refs. (Nov. 4-8, Paper 40.)*

Dynamometer measurements were conducted on a gas generator and internal combustion engine combination, using partial oxidation for the generation of a carbon monoxide-hydrogen fuel gas. A gas generator employing a single-stage catalytic reactor achieved a liquid gasoline to fuel gas conversion of 95%. The product gas allowed the input to the engine to be made as lean as 1.5 (reciprocal equivalence ratio) without the carbon monoxide and hydrocarbon contents of the exhaust gas increasing. Thirty-fold reductions of nitrogen oxides were achieved with no sacrifice in fuel consumption, and four-fold NOx reduction were achieved concurrently with a 17% lower fuel consumption. Future research requires more information on the sealing laws necessary for the enlargement of small test reactors to technical size without loss of gas quality, service life, and conversion rate.

45581 **APTIC NO. 69014**

Miyajima, K., M. Kawai, S. Hirasawa, M. Oya, T. Sakabe, and K. Tanaka

A STUDY OF EXHAUST GAS DESULFURIZATION BY THE DRY LIMESTONE PROCESS. *(Kanshiki sekkaiho ni yoru haiendatsuryu ni kansuru kenkyu). Text in Japanese. Sekko to Sekkai (Gypsum Lime), no. 132:189-195, 1974. 5 refs.*

As a result of a fixed layer test by means of the Benchscale process for exhaust gas desulfurization it was found that: the optimum temperature for burning limestone of 1 - 2 mm particle size is 1000 to 1100 C and the absorbing capacity decreases above 1100 C; the highest desulfurization rate is obtained when the reaction temperature is in the vincinity of 900 C; limestone of smaller particle size brings about a higher desulfurization degree. A flowsheet of a powder injection test plant consisting of combustion chamber, first cooler, reaction chamber, and second cooler is presented. In the case of slaked lime injection if calcium oxide remains for a sufficiently long time, it is completely converted to calcium sulfate. The reaction of CaO powder with sulfur dioxide and oxygen is completed in 1 sec and then calcium sulfate is produced in a slower reaction. The experimental results for slaked lime injection are presented. The highest desulfurization degree is obtained when the combustion gas is in the vicinity of 1050 C.

45582 **APTIC NO. 64892**

Miyamoto, S., A. W. Warrick, and R. J. Prather

LAND DISPOSAL OF WASTE GASES. III: SORPTION PATTERNS FROM BURIED GAS INJECTION PIPES. *J. Environ. Quality, 3(2):161-166, April-June 1974. 7 refs.*

The advancement of sorption fronts resulting from the injection of reactive gases into soils through buried porous pipes is analyzed mathematically and verified experimentally with small scale laboratory models. The sorption front advances in ellipsoidal patterns with faster rates above the pipes for a homogeneous profile. The reacted portion of soil when the front first intersects the ground surfaces is larger for corrugated surfaces than for plane surfaces. The corrugated surface is chosen with the highest elevation point directly over the injection pipe, the lowest point midway between. When a shallow sorptive layer overlies a nonreactive material, the shape of the front is not circular but extends towards the midpoint between parallel pipes where the most water would infiltrate. The concentration of reactants in the outflow increases sharply as the front passes a part of the ground surfaces. The sorption fronts determined experimentally by injecting a dry air and nitrogen dioxide mixture into a small soil tank agreed well with the predicted positions based on an instantaneous reaction. The theoretical procedure as presented is useful for predicting the mean position of the sorption front as a function of gas discharge (or time) for a given buried pipe injection system. Althoough the results compared well with the fast reacting nitrogen dioxide used in the experiment, the analysis is probably inadeaquate for slower-reacting gases. At the same time, the relative advantages of the various geometries should remain valid even for slower reaction rates. (Author abstract modified)

45583 **APTIC NO. 68484**

Miyauchi, Sadao

BLOWER CONTROL APPARATUS FOR FLUE GAS DESULFURIZATION EQUIPMENT. *(Haien datsuryu sochiyo sofuki no contororu sochi). Text in Japanese. (Mitsubishi Denki K. K. (Japan)) Japan. Pat. Sho 49-34578. 3p., Sept. 14, 1974. (Appl. Nov. 26, 1970, 1 claim).*

The capacity of blowers generally must be regulated with the variation in load. A control device was designed for the blower located between the exhaust gas outlet of the desulfurization unit and main flue. In the desulfurization system located in the by-pass of a boiler flue, two pressure converters are placed one at the upper stream of the exhaust gas inlet into the by-pass and the other in the by-pass before the inlet of the desulfurization unit. In this device, the opening of the inlet damper of the above-mentioned induction blower is controlled by the pressure difference between the two converters. The characteristics of this device are the elimination of counterflow of exhaust gas and resulting reduction in electric power consumptin by blower, little increase in resistance in main flue, and little effect on boiler operation.

45584 **APTIC NO. 69108**

Monaghan, M. L., C. C. J. French, and R. G. Freese

A STUDY OF THE DIESEL AS A LIGHT-DUTY POWER PLANT. *Ricardo and Co. Engineers (1927) Ltd. Bridge Works, Shoreham-by-Sea, Sussex (England), Office of Air and Waste Management Contract 68-03-0375, Rept. EPA-460/3-74-011, 330p., July 1974. 699 refs.*

NTIS: PB 236896/AS

A literature survey and engine configuration studies were performed to determine whether the diesel engine is a possible power plant for light duty vehicles in America, using 0.41 g/mi hydrocarbons, 3.4 g/mi carbon monoxide, and 1.5 g/mi nitrogen oxides as the primary emissions target. A secondary environment of 0.41 g/mi hydrocarbons, 3.4 g/mi CO, and 0.4 g/mi NOx was also considered. The light duty vehicle considered was a 4-5 seat compact sedan with good acceleration capabilities. The literature survey indicated that the diesel engine is a viable power plant for light duty use. Engine configuration studies and power plant ratings of nine diesel engines developing 9.6 kw, including indirect and direct injection two-cycle and four-cycle engines, and two gasoline engines (for comparison) indicated that only the indirect injection four-cycle diesels were capable of meeting the primary emissions target with current technology: catalysts were not required to meet the primary target. Gasoline engines were slightly superior to the diesel engines for passenger car use, though diesels performed better in many applications where emphasis was on fuel consumption and durability.

45585 **APTIC NO. 69083**

Moran, John B.

WHY ARE WE HERE TODAY? *Preprint, National Inst. of Health, Research Triangle Park, N. C., National Inst. of Environmental Health Sciences and Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Development, 10p., 1974. (Presented at the Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Durham, N. C., April 16-19, 1974.)*

The current knowledge on the impact of catalytic afterburners for control of mobile source emissions will be reviewed in this symposium. The legislative/regulatory aspects of the Environmental Protection Agency (EPA) research program as it relates to the nonregulated emissions issue are discussed. The regulations for mobile emission sources under the Clean Air Act Amendments are discussed. The EPA currently requires registration of gasoline additives used in interstate commerce and requires tests to determine the effects of fuels and fuel additives on emissions, emission control devices, and public health and welfare. The EPA may restrict or prohibit fuels and/or fuel additives having adverse effects. Under the fuel and fuel additive registration program, attempts were made to ascertain effects of additives on catalyst performance. The program revealed that certain nonregulated emissions from oxidation catalyst-equipped prototype vehicles were substantially different than those from the current motor vehicle population. As a result, a significant shift in program objectives occurred in 1974. The symposium discusses the EPA s research in the following areas: the potential public health problem, noble metals, emissions and measurement methods (efforts to measure nonregulated emissions from motor vehicles, principally sulfate aerosols), and control options/methods.

45586 **APTIC NO. 68509**

Mori, Akira, Yoji Nagata, and Hiromi Nakagawa

DEODORIZATION METHOD AND APPARATUS. *(Dasshu hoho oyobi sochi). Text in Japanese. (Kao Sekken K. K. (Japan)) Japan. Pat. Sho 49-33728. 3p., Sept. 9, 1974. (Appl. Feb. 1, 1969, 2 claims).*

A deodorization method for alcohols, esters, fatty acids, oils and surfactants utilizing a spray of steam and a thin-layer type evaporator designed for deodorization are described. For efficient steam and fluid contact, the steam is sprayed directly at a right angle or slightly angular direction onto the surface of a cylindrical evaporator. The thin-layer evaporator consists of an evaporating cylinder with an evaporating surface on the inner wall and a cylinder with a smaller diameter or a number of circular tubes for spraying steam inside the above-mentioned cylinder. On the outer circumference of the spraying cylinder or circular tube, numerous horizontal holes steam to the thin-layer fluid surface.

45587 **APTIC NO. 68468**

Morita, Yoshiro and Masami Takayasu

THE REMOVAL OF NITROGEN OXIDES BY CATALYTIC REDUCTION. *(Sesshoku kangen ni yoru NOx no jokyo-ho). Text in Japanese. Kagaku Kogyo (Chem. Ind.), 25(10):1149-1153, Oct. 1974. 15 refs.*

The reduction of nitric oxide by hydrogen produces nitrogen, ammonia, or nitrous oxide depending upon the H2 concentration. Ammonia is converted to NO or nitrogen by oxidation with oxygen present in the system. The catalyst used may regain its original activity by introduction of hydrogen since the effect of O2 is reversible. Nitric oxide is also treated by carbon monoxide, producing carbon dioxide. The problem of nitrogen oxides was recognized after the desulfurization techniques were already established. Desulfurizers are therefore usually followed by separate NOx removal equipments. Techniques should improve in the future allowing simultaneous treatment of NOx and sulfur oxides.

45588 **APTIC NO. 69104**

Mosier, Stanley A. and Richard Roberts

LOW-POWER TURBOPROPULSION COMBUSTOR EXHAUST EMISSIONS. VOLUME II. DEMONSTRATION AND TOTAL EMISSION ANALYSIS AND PREDICTION (FINAL TECHNICAL REPORT). *United Aircraft Corp., West Palm Beach, Fla., Pratt and Whitney Aircraft Div., Air Force Contract F33615-71-C-1870, Proj. 3066, Task 306605, Rept. FR-6098, AFAPL-TR-73-36, 231p., April 1974. 19 refs.*

NTIS, DDC: AD 779786

Low-power turbopropulsion combustor design techniques for increasing combustion efficiency of gas turbines at part power were evaluated in terms of their effect on exhaust emissions. The most promising of the low-power design techniques investigated, fuel-air premixing and virtual staging, were incorporated into an annular burner configuration. Demonstration tests were performed on the full-annular version of the burner and a 90-degree sector version. Tests of the sector version resulted in combustion efficiencies of 98% or more. Unburned hydrocarbon concentrations at low-power operating conditions were less than the 18 ppmv program goal, and the measured smoke number over the entire range of operating conditions was less than 5.0. Carbon monoxide concentrations were as low as 56 ppmv, exceeding the program goal of 10 ppmv. Nitrogen oxide concentrations were no worse than those reported for a typical large gas turbine engine and ranged from 32.2-507.9 ppmv. During the course of the program, the analytical model used was refined and extended to include the capability for predicting emissions at high-power conditions.

45589 **APTIC NO. 68262**

Moyer, D. F., J. R. Asik, W. G. Rado, and A. H. Turner

COMBUSTION INITIATION IN OTTO CYCLE ENGINES. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 9.1-9.10. (Nov. 4-8, Paper 9.)*

The effects of increased spark length, increased spark duration, and increased spark energy for automobile internal combustion engines are reviewed in terms of exhaust emissions, fuel economy, and driveability. Increased spark plug gap width exposes a larger volume of the gasoline-air mixture to the spark, thus improving the likelihood of combustion in a nonhomogeneous mixture. The increased gap also reduces the quenching effect of the electrodes on the initial flame kernel. Levels for hydrocarbons, carbon monoxide, and nitrogen oxides obtained with thin electrode spark plugs with extended 0.035 in gap widths are: 2.96, 3.50, and 5.19 g/mi, respectively, as compared to 3.68, 4.93, and 5.20 for 0.105 gap widths. A Ferroresonant Capacitor Discharge Ignition (FCDI) System with a peak secondary voltage capability of 45 kilovolts/50 picofarads allows for the extension of lean misfire limits and exhaust gas recirculation tolerance. Brake specific hydrocarbon, carbon monoxide, and nitrogen oxide values of 2.8, 5.8, and 2.4 are obtained with the FCDI as compared to values of 19.6, 6.9, and 2.5 for conventional ignition systems (both systems using a spark advance of 37 degrees). The FCDI has the capability of sustaining the spark continuously between each capacitive discharge firing, and total spark duration can be adjusted between 0.3 and 12 milliseconds.

45590 **APTIC NO. 68281**

Mueller, H. -G.

THE INTEGRATED SYSTEM ELECTRIC TRACTION ON THE ROAD AND ITS DEVELOPMENT IN THE FEDERAL REPUBLIC OF GERMANY. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Status-*

semin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 29.1-29.10. (Nov. 4-8, Paper 29.)

Electrical propulsion of automobiles is reviewed in terms of its energy conservation benefits and its inherently low pollution characteristics. The principle advantage of electrical propulsion is that the necessary energy for vehicles can be generated from various primary energy sources, including nuclear and coal resources which have longer projected availabilities than petroleum sources. Statistics show that most automobile trips amount to 10 km in distance, well within the range of a battery dimensioned for 50 km. A daily range of 100-120 km is possible from such a battery with continuous recharging. Energy efficiencies of approximately 60-70% for electric vehicles are cited in comparison with an efficiency of about 16% for petroleum-fueled automobiles. Tasks for future research and development of electric vehicular propulsion include: improvements in the structure of electrical power supply, storage batteries, and propulsion elements.

45591 **APTIC NO. 68499**

Murakami, Keiichi and Michio Hirakawa

ABSORPTION OXIDATION OF SULFUR DIOXIDE. *(Nisanka io no kyushu sankaho). Text in Japanese. (Keiichi Murakami (Japan)) Japan. Pat. Sho 49-34319. 4p., Sept. 13, 1974. 1 ref. (Appl. March 31, 1970, 1 claim).*

The absorption oxidation method for the removal and recovery of sulfur dioxide using basic aluminum sulfate solution is described. The exhaust gas containing SO2 and mixed with oxygen is passed through a basic aluminum sulfate solution containing manganese ions at temperatures below boiling point. The aluminum sulfate produced is then reacted with calcium salt or quicklime which produces gas or water by double decomposition, and the basic aluminum sulfate and gypsum dihydride produced are separated. The basis aluminum sulfate is recirculated into the reaction system, while SO2 is removed as gypsum dihydride with high purity. This method is applicable to gases with both high and low SO2 content. High temperature facilitates the absorption oxidation of SO2. The presence of vanadium has no effect on the absorption oxidation of SO2.

45592 **APTIC NO. 68528**

Murata, Yoshio

RECENT DEVELOPMENT OF POLLUTION CONTROL CATALYSTS. *(Kogai boshi kanren shokubai no saikin no shinten). Text in Japanese. Shokubai (Catalyst), 16(5):99-108, Oct. 1974. 30 refs.*

Catalysts for hydrogenation-desulfurization of heavy oil include oxides of molybdenum, cobalt, nickel, tungsten, or the combined oxides, with supporters such as gamma-alumina which has many cavities having diameters larger than 100 A and large total cavity volume. The desired concentration of molybdenum oxide/cobalt oxide (MoO3/CoO) catalyst is 6.5-12 wt%/2-5 wt% and optimum conditions of the supporter are specific area of 150-300 sq m/g, cavity volume of 0.4-0.6 ml/g and specific gravity of 0.6-0.8 g/ml. Catalysts for flue gas desulfurization are iron and copper with Al2O3 as supporter. The formation of carbonyl sulfide has been a problem in flue gas desulfurization. A 10CuO(copper-oxide)-90A12O3 catalyt can almost completely eliminate COS. Oxides of Co, manganese, Fe, chromium, and Ni have been under intensive studies as nitrogen oxides oxidation catalysts. Reduction-decomposition catalysts for NOx are platinum or noble metal oxides supported by Al2O3 or silica. A CuO-Al2O3 catalyst has been successfully used to remove SO2 and NOx simultaneously in the presence of carbon monoxide at high temperature. Catalysts for automotive exhaust CO and hydrocarbon oxidation are Al2O3-supported platinum, palladium, rhodium, CuO, chromic oxide, or manganese oxide (MNO3). Noble metals which are stable and effective at low temperature are used for removal of odors at low concentration.

45593 **APTIC NO. 68510**

Nakai, Yoshiyuki, Tetsuya Yokokawa, Takeo Takahashi, Yoshihiko Ohshima, and Satoru Kitaoka

GAS ABSORPTION TREATMENT DEVICE. *(Gasu kyushu shori sochi). Text in Japanese. (Hikari Kogyo K. K. (Japan)) Japan. Pat. Sho 49-33753. 2p., Sept. 9, 1974. (Appl. Feb. 26, 1969, 1 claim).*

The absorption treatment device designed for nitric oxide and nitrogen dioxide emitted during the production of cellulose nitrate is described. The exhaust gas is commonly treated with ammonia water for the removal of NO and NO2. For more efficient and complete removal, the process was combined with oxidation, using an oxidizing solution such as chlorine water or fresh air and washing with water to remove the ammonia in the exhaust gas. In a horizontal treatment tank partitioned with fluid layers, the exhaust gas injected is successively passed through an ammonia-water layer flowing on vertical filter net for the absorption of NOx, an oxidizing solution layer or fresh air layer for the oxidation of exhaust gas, another ammonia-water layer for further absorption of NOx, and a water layer for the removal of ammonia.

45594 **APTIC NO. 68590**

Niedzwiecki, Richard W. and Robert E. Jones

THE EXPERIMENTAL CLEAN COMBUSTOR PROGRAM - DESCRIPTION AND STATUS. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, Rept. NASA TM X-71547, 15p., 1974 (?). 6 refs. (Presented at the Society of Automotive Engineers Air Transport Meeting, Dallas, Tex., April 30-May 2, 1974.)*

The Experimental Clean Combustor Program is described. The program s objectives include the generation and demonstration of technology for development of advanced commercial CTOL aircraft engines with lower exhaust emissions than current aircraft and the demonstration of this technology in full scale engines in 1976. The program is being conducted in three phases: the screening of low pollutant combustors, refinement of the best combustors, and engine demonstration of the best combustors. Pollution goals are emission index values of 20 and 4 for carbon monoxide and unburned hydrocarbons, respectively, at engine idle conditions and an oxides of nitrogen emission index level of 10 at engine takeoff conditions. Pollution reduction approaches which are being investigated include multiple burning zone combustors, investigations of improved fuel distribution, and preparation and staging of combustor airflow. Phase I of the program is approximately 50% completed, and preliminary test results indicate that all combustor designs, with sufficient additional effort, appear capable of achieving the idle pollutant goals. Reduction of NOx by 50% are presently possible, though further reductions are at the expense of increased combustion inefficiencies at both low and high power conditions. (Author abstract modified)

45595 **APTIC NO. 68456**

Ninomiya, Nobutaka

BAD ODOR PREVENTION BY ADSORPTION. *(Kyuchakuho ni yoru akushu no boshi hoho). Text in Japanese. Preprint, Osaka Technical Assoc. (Japan) and Japan Burner Research Assoc., Osaka (Japan), 20p., 1974 13 refs. (Presented at the Seminar on Bad Odor Control Techniques, 2nd, Osaka, Japan, Aug. 1, 1974.)*

For deodorization by adsorption, activated carbon and a chemical adsorbent are compared. Activated carbon s adsorption capacity for various steams, its retention capacity for various substances, and odor concentration and allowable limits are presented in tables. Various types of adsorption and absorption deodorization are compared. Before selecting an adsorption system, a thorough study of the emission source and the type of odor and toxic gas is necessary. An experiment using a scale model is recommended. Based on these studies, the kind and quantity of bad odor, the type and quantity of appropriate adsorbent, and a pretreatment device (for toxic gases) are selected. The structure should be as simple as possible. Some gases are extremely corrosive, and the material must be selected carefully. When the recovery of adsorbent is involved in the system, some measures should be taken for prevention of secondary pollution.

45596 APTIC NO. 69029

Nwankwo, Jerry and Amos Turk

CATALYTIC OXIDATION OF ADSORBED HYDROCARBONS. *Ann. N. Y. Acad. Sci., vol. 237:397-408, Sept. 27, 1974. 12 refs. (Presented at the Odors: Evaluation, Utilization, and Control Couference, Oct. 1-3, 1973.)*

Thermogravimetric analysis and electron spin resonance spectrometry were used to study the optimum oxidation conditions and oxidation products resulting from the catalytic oxidation of adsorbed odorous hydrocarbons using Calgon-activated carbon. Oxide catalysts were deposited on the activated carbon in the form of aqueous solutions of their nitrates or the ammonium salts of their oxyanions. Oxidation of styrene on chromia-impregnated carbon showed more extensive exothermic reaction at lower temperatures than noncatalytic carbon. Oxidation of styrene to benzaldehyde, carbon dioxide, and water on other oxide catalysts generally occurred within the range of 150-230 C, with much of the styrene adsorbed on carbon samples impregnated with single and mixed metal oxides being retained up to 400 C. The use of metallic copper and nickel impregnations catalyzed oxidation of styrene between 150 and 300 C, but the separation from carbon burn-off was poor. Palladium and platinum catalysts, on the other hand, were very active. Styrene was oxidized completely to CO2 and H2O between 200 and 320 C on palladized carbon and between 180 and 280 C on platinized carbon. In both cases there was a separation of about 120 C from carbon burn-off. Noble metal catalysts were also extremely effective in the oxidation of benzene, toluene, and ethylbenzene. Typical separations between oxidation of ethylbenzene and carbon were 80-100 C. The findings imply that it is possible to remove odorous hydrocarbons from an airstream by concentrating them on catalytically impregnated activated carbons and then oxidizing them without oxidizing the carbon. The time-cycling and concentration features of the process can result in major energy savings.

45597 APTIC NO. 68268

Oblaender, K. and H. G. Schmidt

THE MERCEDES-BENZ LDV DIESEL ENGINE. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 15.1-15.10. (Nov. 4-8, Paper 15.)*

The Mercedes-Benz light duty vehicle diesel engine is described along with emissions test results. The engine employs a prechamber combustion process in contrast to swirl chamber or direct injection systems. The prechamber combustion technique allows for two- to three-fold reduction in hydrocarbons, nitrogen oxides, and carbon monoxide as compared with direct injection systems for diesels with cylinder displacements of 0.5 to 0.6 liter. Emissions tests (13-mode cycle) on vehicles of 10,000 lbs (gross vehicle weight) with the light-duty diesel engine show that carbon monoxide emissions are below the 1977 standards. Nitrogen oxide and hydrocarbon emissions total 5 g/bhp h. The amount of soot emitted is about 0.2 to 0.3 g/mi for a 2.4 liter engine. Assuming that all of the sulfur contained in diesel fuel (0.5% S content) is completely transformed into sulfur dioxide, the light-duty diesel emits an estimated 1.0 g/mi.

45598 APTIC NO. 69052

Ochiai, Toshiyuki

PROBLEMS IN MEASUREMENT TECHNIQUES FOR FLUE GASES: POLLUTION COUNTERMEASURES BY COMBUSTION TECHNIQUES. *(Kogai boshi gijutsu no shinpo to kadai: nensho gijutsu ni yoru kogai taisaku). Text in Japanese. Preprint, Japan Assoc. for Thermal Energy Technology, Tokyo (Japan), 17p., 1974. (Presented at the Heat Management Conference, Tokyo, Japan, June 24-27, 1974.)*

Various methods of controlling nitrogen oxide emissions in combustion gases are discussed. Included are methods of lowering combustion temperature, lowering oxygen concentration in the combustion zone, shortening the combustion gas retention time in the high temperature zone, and low NOx burners such as NFK-TRW and NFK-SRG. Studies should be made for increasing the NOx control ratio in case the use of high nitrogen content fuel becomes necessary due to the fuel shortage. The development of an effective combination of exhaust gas recirculation and step combustion, the development of NOx control burners by using high temperature combustion air, and the development of methods for increasing NOx attenuation efficiency further while using low nitrogen fuel will be needed in the future. The step combustion and low excess air combustion cause increases in the flame volume which necessitates the control of combustion load and may cause increased incomplete combustion and soot. The recirculation of combustion gas causes turbulence and decreases in the boiler efficiency due to the rise in the combustion temperature. The jet injection of steam or water will increase incomplete combustion and soot. The best control method seems to be shortening of the combustion gas retention time in the high temperature zone. The combustion temperature is lowered, but by heat radiation, the boiler efficiency will increase and the quantity of soot will decrease.

45599 APTIC NO. 68474

Oguchi, Yutaka, Junichi Kubo, and Hiroji Nomura

THE DIRECT DESULFURIZATION PROCESS FOR FUEL OIL BY A NEW REACTION MECHANISM. *(Atarashii hanno keishiki ni yoru juyu no chokusetsu datsuryu purosesu). Text in Japanese. Preprint, Japan Petroleum Inst., Tokyo, p. 43-46, 1974. (Presented at the Japan Petroleum Institute Seminar, 17th, Tokyo, Japan, Sept. 25-26, 1974, Paper 11.)*

Direct desulfurization of heavy oil by fluidization of the catalyst is described. The oil and gas are introduced into a double-walled chamber where spherical catalyst particles (average diameter, about 1 mm) are packed. The spent catalyst is removed, and a fresh catalyst introduced as necessary, to keep the catalyst activity constant. Double-walled construction minimizes the splattering of the fine catalyst particles, and the particles that do escape are captured more or less completely by after- equipment. Advantages of this new process include: constant catalytic activity which leads to uniform product purity; constant temperature in the catalytic layer; no continuing pressure loss in the catalytic layer, which makes long-term operation feasible; and flexibility of operation. Disadvantages include: catalyst splatter, complexity of equipment and operations under high temperature and pressure, and decrease in the attainable reaction level because of catalyst fluidization. Catalyst behavior becomes complex, since the diameter of the reaction vessel decreases due to its double-walled construction. Pilot plants were operated, and scaled up in three stages from 0.5 B/D to 500 B/D. Construction of a 10,000 BPSD test plant is under consideration.

45600 APTIC NO. 68949

Okazaki, Toshinari

THE EFFECTS AND ACTUAL CASES OF CATALYTIC OXIDATION METHODS. *(Shokubai sankaho no koka to jitsurei). Text in Japanese. Preprint, Osaka Technical Assoc. (Japan) and Japan Burner Research Assoc., Osaka (Japan), 13p., 1974. (Presented at the Seminar on Bad Odor Control Techniques, 2nd, Osaka, Japan, 1974.)*

The platinum catalyst for catalytic combustion was developed in the United States in 1949 and was introduced to Japan in

1963. The catalytic combustion system developed by UOP and the Japan Beazine Universal Co. burns all combustible odorous and toxic gases from industrial sources at a low temperature in the presence of a catalyst. The use of catalyst makes it possible to cause oxidation at the low temperature of 300-350 C. This reduces the cost of fuel and preheating, the material can be selected from a large variety, and the problem of heat expansion can be easily controlled. The system comprises the burner, combustion air, preheating fuel, a combustion air blower, a catalytic element, a heat exchanger, a thermocouple damper, a combustion gas fan and a stack. The catalytic element is completely metal and has many superior physical properties. Catalytic deteriorators such as metallic steam, metal rusts, organic silicon compounds, halogens, phosphorus, arsenic, sulfur, and organic aerosols must be eliminated prior to combustion to avoid shortening of catalytic life. The recovery of heat and motor power is possible.

45601 **APTIC NO. 68463**

Osa, Tetsuo and Yasukazu Okatsu

REMOVAL OF NITROGEN OXIDES IN LIQUID PHASE. *(Ekiso-ho ni yoru NOx no jokyo-ho). Text in Japanese. Kagaku Kogyo (Chem. Ind.), 25(10):1154-1160, Oct. 1974. 47 refs.*

Both dry and wet processes for removing nitrogen oxides from exhaust gas are compared. Dry processes are either capable of removing sulfur dioxide and soot at the same time or are at least unhindered by their presence. Wet processes involve dissolving NOx in water or aqueous solutions. Since nitric oxide does not react with inorganic substances it must be converted to nitrogen dioxide by high efficiency oxidation. The absorption of NOx with NO and NO2 at a 1:1 ratio occurs most quickly in aqueous alkali and the velocity is 10 times faster than for NO2 alone. The absorption of NO and NO2 can be conducted in a lead chamber designed for the manufacture of sulfuric acid. When diluted by water the decomposition of nitrosyl hydrosulfate occurs. Nitric oxide reacts with some metal complexes to produce nitrosonium complexes. When reducing NO with metal complex catalysts the formation of nitrosyl complexes is desired. The complexes are differentiable by their infrared spectra.

45602 **APTIC NO. 68662**

Osborn, Elburt F.

CLEAN SYNTHETIC FLUID FUELS FROM COAL. SOME PROSPECTS AND PROJECTIONS. *Mining Engineering, 26(9):31-33, Sept. 1974.*

Prospects for the development of fluid fuels from coal are reviewed. The conversion of coal to low-Btu gas offers promise in satisfying the needs of the electric power industry and certain industrial heating and processing operations that long ago converted to natural gas. Any oxygen-steam process for making synthetic natural gas, such as the Synthane process, can be modified to make either intermediate-Btu gas or low-Btu gas, the latter being accomplished by using air instead of oxygen for gasification. Underground or in-situ coal gasification offers the most economical and environmentally acceptable means for low-Btu gas production. The advantage of low-Btu gas lies in lower costs due to less process complexity as compared with SNG. Such gas can be burned either directly in boilers designed specifically for this purpose or, more preferably, in a combined gas turbine-steam turbine cycle which has a better overall thermal efficiency than the conventional cycle used in fossil-fuel fired power stations. All of the combined cycles being proposed burn the low-Btu gas in a combustor, with the hot products of combustion being used to drive a gas turbine. Investment costs for SNG plants range from $250-$300 million for outputs of 250 million cu ft daily.

45603 **APTIC NO. 69844**

Philpot, Charles W.

FLAME RETARDANTS AND PARTICULATE FROM WOOD FIRES. *Combust. Sci. Technol., 9(1-2):13-16, 1974. 5 refs.*

The assumption that wood pyrolysis and glowing combustion in a laboratory simulation actually simulated field burning is questioned. The assumption that the effects of all flame retardants are alike, which is contrary to information in available literature, is also questioned. Generally, flame retardants decrease the maximum rate of combustion and increase the production of particulate char and tar. A retardant that enhances char and tar production will produce more particulate unless it does not also enhance more complete combustion of char by glowing. Most flame retardants also increase the carbon monoxide and dioxide and water produced from the pyrolysis of wood and cellulosic fuels. Most pyrolytic flame retardants emphasize the low energy pathway at the expense of flaming. Whether the residue sustains glowing depends on the chemical composition of the retardant and environmental conditions. Some retardants, such as diammonium phosphate (DAP), apparently polymerize the tars and thus increase smoke production. The DAP is more effective than ammonium sulfate (AS) in slowing flame spread and reducing intensity and produces more residue than AS. The DAP produces substantial increases in particulate, while AS has little effect. Both retardants reduce the intensity of fires in cribs. Therefore, it is obvious that both DAP and AS retardants affect smoke production differently. Since conditions for slash burning are dictated by control conditions, such burning is done at low intensities and in weather conditions not conducive to minimum pollution. This results in poor fuel consumption and large amounts of smoke. Further research, starting with determination of the difference in retarding mechanisms and therefore in particulate and residue production between AS and DAP could lead to the development of chemicals that catalyze glowing to the point of practically no flaming or effluent.

45604 **APTIC NO. 68483**

Pilar, Antonin and Tomas Sakra

POSSIBLE USES OF ABSORBERS LOOSELY FILLED WITH SPHERES FOR THE SEPARATION OF FINELY DISPERSED DUST PARTICLES FROM WASTE GASES. *(Moeglochkeiten der Anwendung von Absorptionsapparaten mit beweglicher Kugellagung zur Beseitigung der feinverteilten Staubteilchen aus Abgasen). Text in German. Wiss. Z. Tech. Hochsch. Chem. Carl Schlorlemmer Leuna-Merseburg, 16(2):251-253, 1974.*

The fractional separation efficiency of a laboratory type turbulent contact absorber with polyethylene balls 15 mm in diameter was studied for model dusts of phosphate, gypsum, burned lime, and epoxy resin. One to nine layers of balls were used at a gas inlet velocity of 3.8 m/sec and dust concentrations ranging from 0.566 to 5.25 g/cu m. The water spray expenditure ranged from 0.082 to 0.195 l/cu m. The overall efficiency amounted to 98% which can be further increased by adequate modification of the operating conditions, such as the ball filling, gas velocity, and the number of plates. The spray density had no significant effect on the separation efficiency. Dust particles larger than 1.5 mm were captured quantitatively. The fractional separation efficiency for the fraction of 1.5-5 micron was higher than those published in the literature.

45605 **APTIC NO. 68255**

Pischinger, F. and G. Schmidt

SINGLE CYLINDER TESTS CONCERNING A LOW EMISSION ENGINE BASED ON AD - MULTIFUEL PROCESS. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 2.6.1-2.6.4. (Nov. 4-8, Paper A 2.6.)*

A single cylinder test engine employing the Kloeckner-Humboldt- Deutz AG AD-multifuel process was used to study the effects of injection and ignition timing on exhaust emissions and brake specific fuel consumption. Regular gasoline was used as the fuel, and injection and ignition timing were varied independently over the entire engine speed range. Brake specific fuel consumption depended on injection timing and reached an optimum at 44 degrees crank angle before top dead center. Nitric oxide emissions were reduced by shifting injection timing towards top dead center, with only a slight attendant increase in hydrocarbon emissions. Variation in injection and ignition timing appears to be a possible approach to reducing nitric oxide emissions without increasing brake specific fuel consumption too much.

45606 **APTIC NO. 68260**

Pischinger, F. and W. Kleinschmidt

POSSIBILITIES OF LOWERING NO-EMISSIONS OF SPARK-IGNITION ENGINES DISCUSSED BY KINETICAL MODELING OF THE ENGINE PROCESS. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 7.1-7.10. 6 refs. (Nov. 4-8, Paper 7.)*

Mathematical model calculations of reductions in nitric oxide emissions in response to internal combustion engine design and operation modifications are presented. The model calculates the exhaust gas pollutant concentrations and the indicated mean effective pressure and efficiency of the engine process with the aid of a computer program. Model calculations indicate that the NO-formation rates during engine combustion are mainly determined by the concentration of atomic oxygen in the post-flame gases. Nitric oxide reductions of 40% are theoretically obtainable from an engine process incorporating the following: high compression ratio, ignition in the vicinity of top dead center, and constant pressure combustion. Gross reductions of NO emissions by exhaust gas recirculation alone require high rates of recirculation, leading to an appreciable loss of indicated mean effective pressure. The model calculations indicate that charge stratification in optimal design may be the most effective way to reduce NO emissions.

45607 **APTIC NO. 69085**

Piver, Warren T.

METHODS PROPOSED TO ACHIEVE AIR QUALITY STANDARDS FOR MOBILE SOURCES AND TECHNOLOGY SURVEILLANCE. *Preprint, National Inst. of Health, Research Triangle Park, N. C., National Inst. of Environmental Health Sciences and Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Development, 15p., 1974. 7 refs. (Presented at the Health Consequences of Environmental Control: Impact of Mobile Emissions Controls, Durham, N. C., April 16-19, 1974.)*

The methods proposed to meet 1975 mobile source standards include alternative antiknocks, exhaust emission control devices, and alternative engine designs. Technology surveillance analysis applied to this situation is an attempt to anticipate potential public and environmental health problems from these methods, before they happen. Components of this analysis are exhaust emission characterization, environmental transport and transformation, levels of public and environmental exposure, and the influence of economics on the selection of alternative methods. Trends are described as a result of the interaction of these different components. In no manner can these trends be interpreted explicitly as to what will really happen. Such an analysis is necessary so that public and environmental health officials have the opportunity to act on potential problems before they happen. Replacements for tetraethyl lead which can achieve the same antiknock, octane-boosting function are discussed and the economic, technological and environmental factors to consider in replacement of tetraethyl lead are described. Catalytic control devices, the thermal, converter-lead trap system, and new types of engines are also discussed. (Author abstract modified)

45608 **APTIC NO. 68285**

Plassmann, Eberhard

POSSIBLE ALTERNATIVE FUELS FOR INTERNAL COMBUSTION ENGINES WITH RESPECT TO LIQUEFIED GAS AND NATURAL GAS. *(Moegliche Alternativkraftstoffe fuer Verbrennungsmotoren unter Beruecksichtigung von Fluessiggas und Erdgas). Text in German. Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 33.1-33.10. 6 refs. (Nov. 4-8, Paper 33.)*

Prospects of possible alternative automotive fuels for internal combustion engines are outlined. The future use of petroleum-based gasoline and diesel fuel are unchallenged by other alternative fuels; synthetic gasoline and synthetic diesel fuel have slim chances of widespread use due to the very high energy expenditure for production and to the practically unchanged environmental load involved. Liquefied propane and butane, available in limited quantities, are expected to be used for special transportation purposes, e.g., in public utility vehicles. The production of liquefied gases from coal involves considerable environmental hazards. Natural gas will not find any widespread use as a motor fuel but its use for other purposes, such as domestic heating, offers more substantial environmental advantages. Methanol produced from coal and hydrogen generated from water, possibly by means of nuclear reactors, have very good chances for widespread use as the raw materials are available in abundance, and they are suitable for use in existing engine designs. Their use involves considerable reduction of traffic-generated air pollution. On a short- to medium-term basis, methanol is the most promising of all alternative motor fuels.

45609 **APTIC NO. 68753**

Rabenhorst, David W.

USE OF FLYWHEELS FOR ENERGY STORAGE. *Preprint, American Chemical Society, 11p., 1974. 20 refs. (Presented at the American Chemical Society, Fall Meeting, Energy Storage Symposium, Atlantic City, N. J., Sept. 12, 1974.)*

The use of a superflywheel energy storage system designed for electric utilities peaking applications is discussed. Estimated cost for 3-hour rate peaking applications is $100/kw based on current projected estimates of the cost of rotor material and fabrication together with motor/generator and control equipment. The flywheel system has the further cost advantage over a pumped storage system in that it can be located closer to the load to minimize transmission costs. The allowable credit for this transmission savings is estimated to be as high as $100/kw for high population density areas, making the total installed cost of the flywheel storage system negligible compared to $179/kw for a pumped storage system. A superflywheel energy storage system is described which should have an overall operating efficiency of about 95%, making it equal to the best energy storage systems currently being proposed. A superflywheel energy storage system appears suitable for any desired location since it does not emit pollutants or require external cooling.

45610 **APTIC NO. 68852**

Rohrmann, C. A., H. T. Fullam, and F. P. Roberts

CONTROL OF SULFUR DIOXIDE EMISSIONS FROM COPPER SMELTERS: VOLUME I - STEAM OXIDATION OF PYRITIC COPPER CONCENTRATES (FINAL REPORT). *Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Environmental Protection Agency Contract 68-02-0025, Program Element 1AB013, ROAP*

21ADC-056, Rept. EPA-650/2-74-085-a, 74p., Sept. 1974. 44 refs.

NTIS: PB 237748/AS

The chemistry, engineering, and economics of steam oxidation as a means for the large-scale, low-cost preparation of hydrogen sulfide for use as an intermediate in the production of elemental sulfur from the gaseous effluents containing sulfur dioxide from conventional copper smelters were studied. Laboratory studies showed that hydrogen sulfide was produced in relatively high yield and rapid rate from the iron sulfide obtained in a first step of neutral or nonoxidizing roasting of pyritic copper concentrates. In addition, the copper sulfides were nonreactive with the high temperature (700-800 C) water vapor. However, equilibrium conditions limited the concentration of H_2S to less than about 1% in the water vapor. No practical means could be foreseen which would significantly increase this concentration. At such a concentration, the energy requirements needed for the supply of high-temperature water vapor assures that the process could not compete economically with a more conventional process. A change in scope of the project to study alternate means of H_2S production without need for a reductant is recommended. An aqueous process based on the use of regenerable hydrochloric acid which still maintains the copper in the form of an enriched sulfide concentrate is the preferred route proposed for further study. (Author abstract modified)

45611 **APTIC NO. 69033**

Sakamoto, Kazuo and Yukinori Tamura

PLASTIC COTTRELL DUST COLLECTORS (ELECTROSTATIC PRECIPITATOR). *(Purasuchikkusei kottoreru ni tsuite). Text in Japanese. Ryusan to Kogyo (Sulfuric Acid Ind.), 27(8):8-13, Aug. 1974. 5 refs.*

Previously, the electrostatic precipitator for low temperature mists was ordinarily made with lead or hard lead, which is highly anti-corrosive but is subject to creeping and short-lived. To lower the cost of the short-lived and expensive lead, the plastic electrostatic precipitator was developed. It is now in the stage of actual use and successful operation. Among various plastic materials, polyvinyl chloride is light, highly anti-corrosive, easily workable, and inexpensive. The most difficult part was to make this highly non-conductive, insulation materials into a conductive material for electrode. The problem of its weakness to heat is still a problem, and this electrostatic precipitator is applicable only to gases lower than 50 C in temperature. Therefore, the use of fiber reinforced plastic, which is anti- corrosive and anti-heat in necessary parts, was applied. The plastic precipitator consists of the upper shell, lower shell, and electrode chamber. The gas enters the lower shell horizontally, directed to rise the vertical chamber by the diffuser and enters the collecting electrode number. The dusts are collected and the clean gas enters the upper shell and is emitted. The collected dusts and mists drop into the lower shell. The tubular collectors have a discharge wire in the center, and the outer layer is lined by conductive plastic. The dust collection rate is more than 99%, the precipitator is highly wear resistant, and it is highly suited for collecting sulfuric acid and other mists of lower than 50 C.

45612 **APTIC NO. 68699**

Sakurada, Toshio

PROBLEMS IN MEASUREMENT TECHNIQUES FOR FLUE GASES: PROGRESS AND FUTURE PROJECTS FOR AIR POLLUTION CONTROL SYSTEMS. *(Kogai boshi gijutsu no shinpo to kadai). Text in Japanese. Preprint, Japan Assoc. for Thermal Energy Technology, Tokyo (Japan), 7p., 1974. (Presented at the Heat Management Conference, Tokyo, Japan, June 24-27, 1974.)*

The area of operation in an ironworks that emits sulfur oxides in the largest quantity is the sintering furnace. At the Kobe Steel Works, control measures have been taken by securing low- sulfur material, by high stacks, and by stack gas desulfurization system. With combustion gases, blast furnaces are no problem since the gas has almost no sulfur content, coke furnace gas is desulfurized by the system, and fuel oil has been changed to low sulfur fuel. The use of naphtha, butane gas, and liquid natural gas are also being studied. With regard to nitrogen oxides, sintering furnaces, coke furnaces, heating furnaces, soaking pits, and boilers emit various amount of NO_x. Studies on nitrogen oxides are relatively new, and methods for measurement have only recently been established. Sampling of NO_x creates a considerable amount of fluctuation, and a method of continuous measurement with accuracy has yet to be developed. Dusts can be controlled by enclosing all emission sources, by spraying water, or by dust collection equipment. At the Kakogawa Plant of this steelwork, 120 dust collectors are in operation, and the daily water consumption for spray is 400 tons.

45613 **APTIC NO. 68730**

Sato, M.

DEVELOPMENT OF THE PROCESS OF EXHAUST GAS DESULFURIZATION. *(Haien datsuryu purosesu no kaihatsu). Text in Japanese. Sekiyu Gakkai Shi (J. Jap. Petroleum Inst., Tokyo), 17(9): 732-735, Sept. 1974. 7 refs.*

A desulfurization process consisting of the absorption, oxidation, and gypsum production is presented. Combustible exhaust gas is cooled by utilizing latent evaporation heat of water and then sent to the absorbing tower in which sulfur dioxide in the exhaust reacts with dilute sulfuric acid before discharge into the air. After absorbing SO_2 gas, the dilute H_2SO_4 is sent to the lower part of the oxidation tower in which the SO_2 is completely oxidized with the aid of an iron catalyst and converted to sufuric acid, of which part is sent to the absorbing tower and the rest to the gypsum-producing process. The catalytic activity of iron is not impaired by impurities in the exhaust gas. Iron shows less activity at low temperature than manganese. The former, however, shows almost the same activity as the latter at the temperature at which exhaust gas from boilers is treated. The rate of desulfurization varies with the concentrations of catalysts, H_2SO_4, SO_2 gas, oxygen concentration in exhaust gas, and the ratio of the absorbing solution to gas. It is necessary to limit the amount of accumulated substances in the process system to a specific value in order to maintain the catalytic efficiency and to prevent erosion.

45614 **APTIC NO. 68911**

Schiefer, R. B. and D. A. Sullivan

LOW BTU FUELS FOR GAS TURBINES. *Preprint, American Society of Mechanical Engineers, New York, 10p., 1974. 18 refs. (Presented at the American Society of Mechanical Engineers, Gas Turbine Conference and Products Show, Zurich, Switzerland, March 30- April 4, 1974, Paper 74-GT-21.)*

The current shortage of conventional gas turbine fuels has created the need for new sources of clean fuel. One of the most promising new fuels is low Btu gaseous fuel, such as that produced by air-injected coal or oil gasifiers or other chemical processes. The various sources of low Btu fuels and their combustion characteristics are discussed. To burn many of the low Btu fuels in the 100-300 Btu/scf range necessitates certain design modifications to the gas turbine originally optimized for high energy fuels. The extent of the modification depends greatly on the low Btu fuel. The impact of low Btu fuels on the gas turbine thermodynamic cycle performance and environmental performance is very encouraging. From the environmental viewpoint, low Btu fuels promise to be clean fuels, while providing increased output at higher thermal cycle efficiencies than achieved with conventional fuels. The advantages of low Btu gaseous fuels are that they broaden basic energy sources, have higher shaft output, give low nitrogen oxide emissions, have low flame radiation, and have wide limits of flammability. Disadvantages are the large fuel volume flows, the slow carbon monoxide reaction rate, and compressor-turbine matching problems. (Author abstract modified)

45615 **APTIC NO. 68280**

Schreck, H. and F. Torres

HYBRID DRIVE WITH KINETIC ENERGY STORE AS A VEHICLE POWER PLANT. *(Hybridantrieb mit kinetischem Energiespeicher als Fahrzeugantrieb). Text in German. Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 28.1-28.11. 4 refs. (Nov. 4-8, Paper 28.)*

Hybrid drive with kinetic energy store as a vehicle power plant is described on the basis of current research conducted in West Germany. The hybrid power plant is composed of a small-capacity conventional vehicle engine, an electric motor, a large-capacity battery, and a flywheel gyro as a store of kinetic energy. The hybrid power plant has the advantage of increased motor efficiency, highly reduced fuel consumption, and high rate of kinetic energy recovery. The hybrid drive is especially advantageous in city traffic where instantaneous load peaks are taken care of by the flywheel rather than by the internal combustion engine. A fuel economy of 45% was achieved in a microbus equipped with the hybrid power plant.

45616 **APTIC NO. 68841**

Schwartz, Lewis B. and Melvin Lieberstein

EFFECT OF RAPPING FREQUENCY ON THE EFFICIENCY OF AN ELECTROSTATIC PRECIPITATOR AT A MUNICIPAL INCINERATOR. *Louisville Univ., Speed Scientific School, Ky.; International Assoc. for Pollution Control; American Chemical Society, Washington, D. C.; American Inst. of Chemical Engineers, New York; American Inst. of Industrial Engineers, New York; American Society of Civil Engineers, New York; American Society of Mechanical Engineers, New York; American Water Works Assoc., New York; Inst. of Electrical and Electronic Engineers, New York; and Water Pollution Control Assoc., Environ. Eng. Sci. Conf., Annu. Meet., Louisville, Ky., 1974, p. 629-655. 6 refs. (March 4-5.)*

In an effort to improve collection efficiency of an electrostatic precipitator, the rapping frequency of the collector plates and discharge wires of a single stage Wheelabrator precipitator was varied in a manner intended to produce optimum precipitator performance. The precipitator was installed in one of the four 250 ton/day refuse-burning furnace system of the Southwest Brooklyn Municipal Incinerator as part of the program to upgrade the six existing New York City municipal incinerators. Particulate emissions were measured at both the precipitator inlet and outlet by sampling trains and at the outlet by continuous sampling and recording equipment. A reduction in the particulate emission rate at the outlet of the precipitator resulted from a reduction in rapping time of the collector plates and a decrease in the frequency of rapping of the collecting plates. The performance of an electrostatic precipitator thus can be greatly affected by a variation in rapping frequency of the collector plates, and to a lesser extent the discharge wires. Additional studies are required to determine the rapping frequency which will maximize precipitator collection efficiency. (Author abstract)

45617 **APTIC NO. 68272**

Sebestyen, Thomas M., Charles E. Wagner, and Leon D. Lewis

REPORT OF THE EPA/AAPSD - CHRYSLER CORPORATION GAS TURBINE DEVELOPMENT PROGRAM. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 19.1-19.21. (Nov. 4-8, Paper 19.)*

The status of an Environmental Protection Agency/Chrysler Baseline Gas Turbine Development Program is reviewed in terms of specifications and progress towards achieving upgraded engine fuel economy and emission goals and progress by the Garrett Corporation in developing an integrating control system for the upgraded engine. The purpose of the baseline program is to provide a design base for the upgraded program which specifies emission goals for hydrocarbons, carbon monoxide, and nitrogen oxides of 0.41, 3.4, and 0.4 g/mi, respectively. Average baseline vehicle test results for a Chrysler burner on the 12.5 km federal driving cycle are 2.7 and 1.4 g/km for carbon monoxide and nitrogen oxides, respectively. Projecting to upgraded engine conditions, no problem in meeting CO goals is forseen, although extremely close control of all engine variables will be required to meet the NOx goal. A negligible amount of hydrocarbon emissions exists at steady-state operation for any of the burners being considered; but, if the flame is extinguished during gas generator decelerations, enough hydrocarbons will be formed during relights to amount to from 0.6-0.9 g/km on a baseline engine. The design of a fully integrated engine control system is currently in progress.

45618 **APTIC NO. 68907**

Shepherd, D. G.

A LOW-POLLUTION ON SITE, ENERGY STORAGE SYSTEM FOR PEAK-POWER SUPPLY. *Preprint, American Society of Mechanical Engineers, New York, 7p., 1974. 5 refs. (Presented at the American Society of Mechanical Engineers, Gas Turbine Conference and Products Show, Zurich, Switzerland, March 30-April 4, 1974, Paper 74-GT-134.)*

A scheme is presented whereby surplus power during reduced demand periods is used to liquefy air which can be stored and used later to supply peak power with considerably reduced fuel requirements. All the component processes of the system are established techniques and are very largely automatic in operation, and the location is on-site. Such a system can be constructed and placed on-line in a minimum of time and with greatly reduced pollution control requirements. It is capable of considerable flexibility in the use of the liquefied product as air or as the separated constituents as oxygen and nitrogen, and thus furnishes a number of ways of optimum utilization as operating conditions and economic circumstances change. (Author abstract)

45619 **APTIC NO. 68269**

Siencnik, L., J. Keylwert, P. Hofbauer, and B. Wiedemann

EXPANDING VOLUME ENGINES WITH CONTINUOUS INTERNAL COMBUSTION. *(Arbeitsraumbildende Maschinen mit innerer, kontinuierlicher Verbrennung (IKV)). Text in German. Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 16.1-16.13. 7 refs. (Nov. 4-8, Paper 16.)*

The continuously operating internal combustion system in conjunction with expanding volume engines is characterized regarding its efficiency and exhaust emissions on the basis of research being conducted in this area. This system is similar to the open-cycle gas turbine in that it uses a combustion chamber to feed the mechanical power section. However, the rotating part of the turbo-machine is replaced by an expanding volume engine, such as reciprocating or rotating piston engines. In lower ranges where gas turbines operate less efficiently the continuously operating internal combustion system offers the possibilities of controlling exhaust emissions and noise and improving efficiency through heat-exchangers. The quality of the exhaust gas generated by the continuously operating internal combustion chamber is strongly dependent on the evolution of the pressure and temperature during the expansion of the hot gases supplied by the combustion chamber. The current research will make it possible to determine, as early as in March 1975, whether the expanding volume engine with continuously operating internal combustion chamber will be superior to conventional reciprocating piston engines.

45620 **APTIC NO. 69082**

Somers, Joseph H.

AUTOMOTIVE SULFATE EMISSION DATA. *Preprint, National Inst. of Health, Research Triangle Park, N. C., National Inst. of Environmental Health Sciences and Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Development, 32p., 1974. 16 refs. (Presented at the Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Durham, N. C., April 16-19, 1974.)*

Automotive sulfate emissions were measured from catalyst and noncatalyst cars in a series of studies. While two investigations found significant sulfate formation in noncatalyst cars, three studies found only trace levels from noncatalyst cars. All of the investigations showed much higher quantities of sulfate emitted from catalyst cars. Pelleted catalysts had much lower sulfate emissions over low speed Environmental Protection Agency Federal Test Procedures than monolith catalysts. This was probably due to temporary storage of sulfates on the catalyst due to chemical interaction with the alumina pellets. The sulfate compounds were, to a large degree, emitted later under higher speed conditions which resulted in higher catalyst temperatures which decomposed the alumina salt. Future work will be directed towards further elucidation of this storage mechanism as well as determining in detail how factors such as air injection rate and catalyst location affect sulfate emissions. (Author abstract)

45621 **APTIC NO. 69150**

Sondreal, Everett A., Philip H. Tufte, and Stanley J. Selle

WET SCRUBBING OF SO2 WITH ALKALI IN WESTERN COAL ASH. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 30p., 1974. 5 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-272.)*

The amount of ash alkali in Western coals often stoichiometrically exceeds the coal sulfur content and could be the source of alkali for scrubbing. Therefore, a method for utilizing the alkali in Western coal ash for scrubbing sulfur dioxide in flue gas was studied. The method utilized limestone scrubbing technology, substituting Western fly ash for limestone, in a 120 scfm flooded disk venturi scrubbing system. The goals were to determine SO2 scrubbing efficiency and rate of gypsum scale formation as a function of ash type, ash add rate, SO2 inlet level, liquid/gas ratio, makeup water, suspended and dissolved solids, and supplementary limestone and acetic acid as additives. Results for scrubbing using fly ash from a typical North Dakota lignite indicated an SO2 removal efficiency of 62% for a scrubber inlet SO2 level of 840 ppm, more than meeting the 1.2 lbs/MMBtu Federal emission standard. Scrubbing with a low-alkali subbituminous ash with 25% stoichiometric limestone added gave a 51% removal of 840 ppm SO2. Limestone technology can thus be accommodated to ash alkali scrubbing. Sulfur dioxide removal efficiencies under average conditions of ash analyses and amounts of coal sulfur are adequate to meet EPA new source requirements for many Western U. S. coals. For some subbituminous coals for which ash alkali may be low in relation to sulfur level, supplementary limestone can be used to increase removals to a desirable level. An effective means of scale control was recirculation of ash solids. Ash alkali scrubbing eliminates or greatly reduces the need for limestone. It also produces a quickly settling waste product in lesser quantity than with lime scrubbing. (Author abstract)

45622 **APTIC NO. 68902**

Spaite, P. W.

LIMESTONE SCRUBBER SLUDGE - AN EXAMPLE OF AIR POLLUTION CONVERTED TO SOLID WASTE. *Environmental Protection Agency, Cincinnati, Ohio, National Environmental Research Center and Battelle Memorial Inst., Ohio, Columbus Labs., Pollut. Control Technol. Assess., Proc. Environ. Resour. Conf., Columbus, Ohio, 1974, EPA-670-74-006, p. 38-42. 2 refs. (May 1-3.)*

Estimates are provided for the amounts of solid waste generated from electric utilities using lime and limestone scrubbing for sulfur oxide control. A typical Ohio power plant buring 3.3% sulfur coal with 12% ash and utilizing a limestone scrubbing system is estimated to produce almost 1.5 million tons/yr of waste composed basically of calcium sulfite/calcium sulfate sludge containing some unreacted calcium carbonate, fly ash, and water. The amount is slightly less for lime scrubbing. Using the same assumptions with respect to sulfur content, plant load factor, and the like on a national basis and assuming that 75% of the flue gas cleaning is limestone scrubbing, the calculated national sludge production rate for 1980 is about 150 million tons/yr (75 million tons/yr dry basis) which is a modest increase in the total national solid waste output. Limestone scrubber sludges do not appear to be any more difficult to handle than other solid waste problems which are similar in magnitude and of a similar nature.

45623 **APTIC NO. 69167**

Spindt, R. S. and R. E. Kline

ENVIRONMENTAL CONSIDERATIONS AND THE ENERGY CRISIS – THE EFFECT ON GASOLINE COMPOSITION. *Preprint, Society of Automotive Engineers, Inc., Warrendale, Pa., 7p., 1974. 14 refs. (Presented at the Society of Automotive Engineers, National Combined Farm, Construction and Industrial Machinery and Powerplant Meetings, Milwaukee, Wis., Sept. 9-12, 1974, Paper 740693.)*

The current shortage of gasoline and the existence of vehicle emission standards have raised the question of what tomorrow s gasoline will be like. The environmental consideration and the energy supply situation are reviewed. Likely future processing schemes and gasoline properties expected in the future (octane numbers, Reid vapor pressure, distillation range, aromatics, olefins, lead additives, and sulfur) are also discussed. In general, current processes will continue to be used, and future gasolines will have properties similar to present fuels. More octane numbers will be obtained by processing than by the use of lead alkyls, which may result in more aromatics and less sulfur. (Author abstract modified)

45624 **APTIC NO. 68293**

Sternlicht, Beno and George M. Thur

ALTERNATIVE PRIME MOVERS FOR FUTURE AUTOMOBILES. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 42.1-42.27. 20 refs. (Nov. 4-8, Paper 42.)*

Alternative motor vehicle power plants for achieving better fuel consumption and lower emissions are discussed, and Environmental Protection Agency test results (Federal Driving Cycle) are presented for conventional spark ignition engines, rotary engines, stratified charge systems, diesels, rankine systems, and gas turbines. New fuels and energy storage devices (both electrical and mechanical) are also discussed. Only three engine concepts met the original 1976 emission standards: a spark-ignition engine with an exhaust catalyst, spark retard, and air injection; a stratified charge engine with exhaust gas recirculation, an exhaust catalyst, and intake air throttling; and a Carter Rankine cycle system without any exhaust treatment. Hydrocarbon, carbon monoxide, and nitrogen oxide emissions for the three systems were respectively: 0.27, 2.18, and 0.13 g/mi for the spark ignition engine; 0.3, 0.67, and 0.34 g/mi for the stratified charge system; and 0.4, 1.09, and 0.33 g/mi for the Carter Rankine system. A tabulation of various proposed alternative fuels for automobiles is also provided and includes the heat value, relative toxicity, ease of storage, and estimated 1982 cost. Various energy sources and energy storage systems, including nuclear, solar, kinetic, and electrochemical types, are also compared.

45625 **APTIC NO. 68548**

Sternlicht, Beno

WHICH AUTOMOTIVE ENGINES IN THE FUTURE? *Preprint, American Society of Mechanical Engineers, New York, 12p., 1974. 17 refs. (Presented at the American Society of Mechanical Engineers, Diesel and Gas Engine Power Conference and Exhibit, Houston, Tex., April 28-May 2, 1974, Paper 74-DGP-16.)*

The automobile is a major factor in four national issues -- energy, natural resources, pollution, and transportation. As such, it represents a problem, a challenge, and an opportunity for engineering and management. The national issues involved, impacts of more efficient automobile engines on pollution and transportation, the cost benefits of more efficient engines, and the necessity for a balanced engine development program are discussed. Some predictions are made on future improved automotive engines. The stratified charge engine looks potentially very attractive in the near term, offering required low emissions without sacrifice in fuel economy. The catalytic converter will probably have a short history. On a longer term basis, there are five candidates -- electrical vehicles, Stirling engines, diesel engines, and Warren engines. The Wankel, Rankine, and gas turbine engines are unlikely to become automotive powerplants with impact by the year 2000. (Author abstract modified)

45626 **APTIC NO. 68379**

Storment, J. O., K. J. Springer, and K. M. Hergenrother

NOX STUDIES WITH EMD 2-567 DIESEL ENGINE. *Preprint, American Society of Mechanical Engineers, New York, 13p., 1974. 7 refs. (Presented at the American Society of Mechanical Engineers, Diesel and Gas Engine Power Conference and Exhibit, Houston, Tex., April 28-May 2, 1974, Paper 74-DGP-14.)*

The effectiveness of several methods for reducing nitrogen oxide emissions from a two-cylinder version of an EMD series 567C locomotive engine was studied. The effectiveness of a particular method was determined by the amount of NOx reduction achieved, the observed effect of other emissions and engine power, and the ease and potential expense with which the method could be implemented. The retarded injection timing was the most effective reduction method. The next most effective method was exhaust gas recirculation, with the recirculated exhaust cooled to 125- 150 F. It was necessary to reduce engine power output to keep smoke opacity from increasing when either reduction method was used. Inlet air humidification, whether used with standard or retarded injection timing, produced moderate reductions in NOx emission. Reduction of scavenging air volume and hot (uncooled) exhaust gas recirculation resulted in much lower NOx, but produced substantially higher levels of carbon monoxide and smoke, and engine power derating was again required to control smoke opacity. The new needle valve and low-sac injectors were generally superior to the older spherical valve injectors in their emission characteristics. Although these various effects appeared to be real, it was not known whether the laboratory engine behavior and absolute emission levels were applicable to full-size series 567 engines is field service. (Author, abstract modified)

45627 **APTIC NO. 68264**

Sugiura, Hideo

THE CONCEPT OF THE CVCC ENGINE SYSTEM. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 11.1-11.10. 2 refs. (Nov. 4-8, Paper 11.)*

A Honda stratified charge automobile engine of the compound vortex, controlled combustion type (CVCC) is described which is capable of meeting the original 1975 American automobile emission standards without aftertreatment devices and without sacrifice in fuel economy or driveability. A large amount of lean mixture is supplied to a main combustion chamber; while a small amount of rich mixture is supplied to an auxiliary combustion chamber, making the overall mixture ratio lean. A stratification of a rich mixture around the spark plug at the auxiliary chamber, a moderate mixture near the torch opening in the main chamber, and a lean mixture in the remainder of the main chamber if formed at the end of the combustion stroke. The stratification and a lack of strong turbulence in the main chamber are prerequisites for achieving the engine s slow combustion. Carbon monoxide, hydrocarbon, and nitrogen oxide exhaust emissions (measured under LA-4 Mode) for a manual CVCC engine of 1488 cu in. displacement are 2.42, 0.24, and 1.39 g/mi, respectively.

45628 **APTIC NO. 68478**

Tagawa, Taichi

DEODORIZERS AND CATALYSTS. *(Dasshu sochi to shokubai). Text in Japanese. Kagaku Kojo (Chem. Factory), 18(9):41-46, Sept. 1974. 5 refs.*

Catalysts used in deodorizers include precious metals such as platinum and palladium and base metals such as iron, nickel, cobalt, and manganese. In order of capacity to oxidize methane Pd shows the highest activity and is converted to palladium monoxide or undergoes a change in its active site with a high concentration of oxygen present at 350 C. Compared with Pt, Pd is less resistant to sulfur compounds. Though cobalt tetraoxide and manganese trioxide show a high activity, they show a depression in their activity when treated at a high temperature for many hours. The activity of the latter is ameliorated at a low temperature and is more heat-resistant if the former or other metallic oxides are added. Gamma alumina is used in most cases since its effective area as a carrier is large and the temperature to be maintained is in the range of less than 500 C. Platinum is the most appropriate catalyst but it is expensive. High pressure loss leads to loss of power. Ordinary granular catalysts are in the form of a pellet or cube in most cases. Pressure loss is less in the form of a tube than in the form of cube. Pellet-form catalysts are liable to be worn out while in use.

45629 **APTIC NO. 68485**

Terakura, Takayoshi

DEODORIZATION APPARATUS FOR NIGHT SOIL TREATMENT FACILTIES. *(Shinyo shori shisetsu ni okeru dasshu sochi). Text in Japanese. (Seki City (Japan)) Japan. Pat. Sho 49-34894. 4p., Sept. 18, 1974. 2 refs. (Appl. April 7, 1969, 1 claim).*

A deodorization device for night soil treatment facilities was designed based on the fact that most malodorants such as ammonia and hydrogen sulfide are water soluble. In a closed cylindrical tank equipped with a nozzle for spraying water located at the top, the malodorous gas inlet pipe with branches extending into the upper and lower dispersion layers is located between the upper an/lower dispersion layers each consisting of four layers filled with contacting element. The malodorants are dissolved in water and removed from malodorous gas while passing through dispersion layers, and the water containing dissolved malodorant is disinfected using chlorine before discharging into the drainage pipe. The odorant concentrations in samples drawn from five locations in the deodorization tank are monitored, and the amount of water sprayed and injection rate of malodorous gas are regulated accordingly.

45630 **APTIC NO. 68843**

Theodore, Louis, Patrick Byrne, Steven Murtha, and A. J. Buonicore, III

PRESSURE DROP IN VENTURI SCRUBBERS. I. DESCRIBING EQUATIONS. *Louisville Univ., Speed*

Scientific School, Ky.; International Assoc. for Pollution Control; American Chemical Society, Washington, D. C.; American Inst. of Chemical Engineers, New York; American Inst. of Industrial Engineers, New York; American Society of Civil Engineers, New York; American Society of Mechanical Engineers, New York; American Water Works Assoc., New York; Inst. of Electrical and Electronic Engineers, New York; and Water Pollution Control Assoc., New York, Environ. Eng. Sci. Conf., Annu. Meet., Louisville, Ky., 1974, p. 677-692. 7 refs. (March 4-5.)

Until now, industry has relied primarily on empirical formulas obtained from pilot plant models and existing equipment to predict the collection efficiency and pressure drop of new scrubbers. A major drawback of this method is that venturi scrubbers are of fixed configuration and usually operate within a limited range of conditions. The extension of these formulas to a venturi with a different configuration, different aerosol, and different operating conditions is questionable. Stricter particulate emission standards make the present method inadequate and costly. A model is developed to predict the pressure drop through a venturi scrubber. The model is capable of accepting different venturi configurations and a wide range of operating conditions. When coupled with a satisfactory model to predict collection efficiency, this model can be used to find the most economical venturi scrubber for a given application without recourse to experimental data. (Author introduction modified)

45631 **APTIC NO. 68249**

Thielicke, Wolfram

STUDIES FOR IMPROVED EMISSION CONTROL IN GASOLINE-OPERATED AUTOMOTIVE ENGINES BY THE USE OF MAN S FM COMBUSTION SYSTEM. *Text in German. Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. A2.7.1-A2.7.6. (Nov. 4-8, Paper A2.7.)*

A single-cylinder, multifuel stratified-charge FM test motor by MAN, developed for the study of engine design on exhaust emission, as well as a motor test stand incorporating this test motor are described. The test motor, equipped with two or three valves optionally, permits four different arrangements of the nozzle and spark plug relative to each other.

45632 **APTIC NO. 68414**

Tien, John K., Mahendra K. Malu, Jeffrey M. Davidson, and Norman A. Gjostein

EXTENSION AND APPLICATION OF OXIDATION AND OXIDE SPALLATION MECHANISMS TO THE SELECTION OF AUTOMOBILE EMISSION CONTROL HARDWARE. *Preprint, Society of Automotive Engineers, Inc., New York, 9p., 1974. 11 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress, Detroit, Mich., Feb. 25-March 1, 1974, Paper 740090.)*

The basic prinicples of oxidation and oxide spallation are extended in order that the cyclic oxidation behavior of constitutionally complex alloys can be predicted with minimal experimental input. The analytical predictions are applied to many ferritic stainless steels, austenitic stainless steels, and nickel-base alloys, and are in qualitative agreement with experimental results. Based on the extended principles of oxidation and oxide spallation, general guidelines are developed for the selection of cyclic, oxide spallation-resistant alloys. These guidelines are used to rank alloys according to their potential as automobile emission control exhaust materials. The 1800 F thermal shocks are assumed to be a reasonable upper limit to be experienced by the typical hardware during emission control applications. The nickel-base alloys, Inconel 601 and Hastelloy-X, have excellent oxidation and cyclic oxide spallation resistance and high-temperature strength, but they may be costly. The ferritic stainless steels, OR-1 and SR-18, also have excellent oxidation and cyclic oxide spallation resistance, and they are cheaper than the nickel alloys. However, they are much weaker at high temperatures and will probably have to be more rigidly supported for high-temperature piping applications. Stainless steels 304 and 410 have poor oxidation resistance and inferior cyclic spallation resistance. They are expensive and are relatively strong at high temperatures. Although these alloys cannot withstand 1800 F oxidation or thermal shocks without exfoliating oxides, they are effective when the oxidation temperature is lowered to 1500 F. (Author abstract modified)

45633 **APTIC NO. 66207**

Turbin, Kenneth L.

APPARATUS FOR DEHUMIDIFYING AND DILUTING A WET GAS STREAM. *(The Dow Chemical Co., Midland, Mich.) U. S. Pat. 3,792,572. 6p., Feb. 19, 1974. 4 refs. (Appl. June 2, 1972, 1 claim).*

A method for reducing the humidity and lowering the temperature of a wet gas effluent stream before discharging the stream to the atmosphere and, hence, reducing the tendency of the effluent to form fog plumes and result in drizzle precipitation is presented to overcome prior art deficiencies concerning excessive heat energy requirements, difficulty in predicting the minimum amount of super heat required, and fairly large cooling water requirements. The process involves passing the wet gas through a heat exchanger positioned in a main chamber, while simultaneously cooling the wet gas stream by an ambient temperature air stream which is drawn into the main chamber and forced past the heat exchanger. The condensate in the cooled wet stream is removed in a second chamber, and the remaining gas phase is dispersed back into a mixing compartment of the main chamber where the gas phase of the effluent stream mixes with the ambient air, diluting the effluent and reducing its humidity before the stream is discharged to the atmosphere. (Author abstract modified)

45634 **APTIC NO. 68959**

Ushio, Isamu

CHARACTERISTICS OF ACTIVATED POWDER CARBON AND METHODS FOR ITS REGENERATION. *(Funmatsu kasseitan no tokusei to saiseiho). Text in Japanese. Kagaku Kojo (Chem. Factory), 18(9):69-73, Sept. 1974. 34 refs.*

Activated powder carbon possess an advantage in absorption of organic substances of a high molecular weight (which diffuse slowly) since it has a large surface area in terms of unit weight. Although there exist some differences depending on raw materials and manufacturing conditions, activated powder carbon is always charged with anions in water. If the concentration of particles is sufficiently high in the vicinity of the isoelectric point, activated powder carbon coagulates readily. It is separated without coagulants if sludge contact-sludge blanket complex clarifiers are used for treatment of waste water. The addition of high molecular weight electrolytes at the level of several ppm enhances its settling velocity and the clarification of waste water. Activated powder carbon, compared with granular carbon, shows a high filtration resistance as well as a permeability resistance and a larger filtration resistance when colloid-like suspension is present in the waste water to be treated. There are many cases in which activated powder carbon can not be filtered. Activated powder carbon can be adapted to the mixture filtration process, the filtration process forming layers for industrial use, and the mixer settler process for the treatment of waste water. In either case the multiple countercurrent contact process is available to enhance utilization of activated powder carbon. The thermal regeneration of activated carbon is discussed.

45635 **APTIC NO. 68505**

Valsechi, Octavio

REPLACEMENT OF GASOLINE AS MOTOR FUEL BY ETHYL ALCOHOL, AND RELATED PROBLEMS. *(O alcool etilico substituindo a gasolina como fonte de energia motora e alguns problems correlatos). Text in Portuguese. Brasil Acucareiro, 83(2):67-74, Feb. 1974.*

The possibilities, problems, and environmental impacts of the use of ethyl alcohol, produced in large quantities in Brazil, as a motor fuel for automobiles are discussed. While the production of ethyl alcohol is associated with environmental, pollution, its use as a motor fuel involves considerable reduction of the automotive exhaust-generated air pollution because its combustion products (water and carbon dioxide) are environmentally harmless. Ethyl alcohol as a motor fuel should be used mixed with gasoline to limit the reduction of the octane number and the thermal efficiency of the engine. Ethylene-gasoline mixtures require no additives, such as lead.

45636 **APTIC NO. 68449**

Vanderlinde, L. G.

STATE OF THE ART...SMOKELESS FLARES. *Hydrocarbon Process., 53(10):99-104, Oct. 1974. 15 refs. (Presented at the Gas Producers Association Gulf Coast Regional Meeting, Corpus Christi, Tex., Feb. 1974.)*

The design of smokeless flares is discussed. Flares are made smokeless by providing an adequate quantity and distribution of oxygen in the combustion zone. Sufficient primary air is induced in the combustion zone by throttling steam, gas, water, or air into the flare gas stream with a flare tip of a design based on various parameters. The costs of the flare system vary with tip type, the hydrocarbon being burned, utilities availability, materials of construction, and flare gas rate. The ideal flare burns hydrocarbon emissions in a noiseless, odorless, and invisible manner. There is no flare ideal system, but properly designed mechanical equipment can make any flare smokeless. The key factors affecting design of smokeless flare are quantity and distribution of O2 in the combustion zone; temperature in the combustion zone; and type of hydrocarbon being burned. Other factors to consider are noise generation, heat radiation, the availability of utilities, and flaring rate and frequency. (Author abstract modified)

45637 **APTIC NO. 68461**

Volskiy, V. A.

AIR FLOW CONTROL DEVICE FOR PNEUMATIC LOADING. *(Regulyator raskhoda vozdukha dlya pnevmaticheskoy zakladki). Text in Russian. Ugol, no. 7:42-43, 1974.*

Air flow control device for compressed-air-operated loading and conveyor systems for mines is described. The control device uses the pressure occurring at the beginning of the loading pipeline as an input signal. The purpose of the control device is to minimize compressed-air consumption and also of the related dust formation.

45638 **APTIC NO. 68905**

Walzer, P., R. Buchheim, P. Rottenkolber, and G. Hagemann

PASSENGER CAR PERFORMANCE WITH THE EXPERIMENTAL GAS TURBINE VW--GT70. *Preprint, American Society of Mechanical Engineers, New York, 11p., 1974. 5 refs. (Presented at the American Society of Mechanical Engineers, Gas Turbine Conference and Products Show, Zurich, Switzerland, March 30-April 4, 1974, Paper 74-GT-108.)*

The performance obtained by the Volkswagenwerk AG with an experimental gas turbine power plant in a passenger car is described. The power unit and its installation in the vehicle are described, and results of operational tests are given. The investigations covered both the road performance and the effect on the environment of the experimental turbine car. The results are compared with those from spark ignition engines of similar power. Possible solutions are indicated where the results are considered to be not yet satisfactory. The turbine car met proposed emission standards up to 1976 for hydrocarbons, carbon monoxide, and nitrogen oxides. The NOx emissions were too high to meet the 1977 standards, however. The relationships of fuel consumption and engine operating cycles with emissions were also studied. (Author abstract modified)

45639 **APTIC NO. 68455**

Watanabe, Shoji

DEVELOPMENT OF NITROGEN OXIDE REMOVAL TECHNIQUES FOR FLUE GASES (WITH AN EMPHASIS ON THE SELECTIVE CATALYTIC REDUCTION METHOD). *(Endo gasu kara no chisso sankabutsu jokyo gijutsu no haikatsu: toku ni sentakuteki sesshoku kangenho o chushin to shite). Text in Japanese. Kagaku to Kygyo (Tokyo) (Chem. Chem. Ind.), 48(10):12-15, Oct. 1974.*

Experiments were carried out to evaluate various catalysts for nitric oxide removal from flue gas containing 800-950 ppm sulfur dioxide, 1090-1110 ppm NO, and 1370-1390 ppm ammonia. The experimental conditions were: space speed, 10700-10900/hr; pressure, 1 atm; catalyst volume, 26.4 ml; and catalyst particle size, 5 by 6 mesh. Molybdenum oxide supported by alumina showed no NO conversion at 200 C, and to 20%, 42%, 62% and 65% at 250 C, 300 C, 350 C and 400 C, respectively. The MoO with co-catalysts such as lithium, beryllium, boron, sodium, magnesium, aluminum, potassium, calcium, titanium, cobalt, nickel, copper, and zirconium gave higher NO conversion rates up to about 95%. The catalyst life decreased, however, as the activity increased. Ammonia could be completely converted to nitrogen and water without NO or nitogren dioxide formation.

45640 **APTIC NO. 68451**

Watkins, Robert O., James B. Borden, and Fred F. Kirchner

CAN VEHICLE TRAVEL BE REDUCE 20 PERCENT IN THE SOUTH COAST AIR BASIN? *Air Qual. Environ. Factors, no. 492:9-16, 1974. 10 refs.*

The possibility of reducing vehicle travel in California s South Coast Air Basin was evaluated. The 1970 Air Quality Standards of California recognized that the standards could not be achieved by controlling exhaust pipes and smoke stacks alone. Restrictions in the use of the personal automobile would also be required. Analysis of travel, travel constraints, and reduction strategies are reviewed. A 20% reduction in vehicle miles of travel for the basin cannot be achieved in the short run because the automobile is more of a necessity here than in many other urban areas. This stems from the general form of the basin and its low population density. A 20% reduction is possible in the long run if area growth is controlled and land use is restricted. (Author abstract modified)

45641 **APTIC NO. 68771**

Williams, J. R.

COMPARATIVE EVALUATION OF SOLAR, FISSION, FUSION, AND FOSSIL ENERGY RESOURCES. PART V. CONCLUSIONS AND RECOMMENDATIONS (FINAL REPORT). *Georgia Inst. of Technology, Atlanta, Schools of Mechanical and Nuclear Engineering, National Aeronautics and Space Administration Grant NGR-11-002-165, 9p., 1974 (?). 5 refs.*

NTIS: N74-22604

Conclusions and recommendations are presented from a comparative evaluation of solar, fission, fusion, and fossil energy resources. Rapid depletion of non-renewable fossil resources and air pollution resulting from the burning of fossil fuels, particularly carbon dioxide which affects global mean temperature, dictate that the United States establish the goal of eliminating fossil fuel combustion in this century. The following actions are recommended for achieving this goal: acceleration of the construction of nuclear reactors and the development and deployment of nuclear breeder reactors; initiation of a crash program to develop and install solar energy systems with a funding level of about half that devoted to nuclear energy; the pursuance of all other energy alternatives at appropriate funding levels; and the substitution of coal for gas and oil for the immediate energy crisis. The use of tall stacks for power plants burning coal is suggested as an interim sulfur dioxide control measure.

45642 **APTIC NO. 69024**

Wuersch, G.

SEPARATION OF OIL MISTS AT MACHINE TOOLS. *(Oelnebelabscheidung an Werkzeugmaschiner). Text in German. Technica, 23(19):1615- 1619, 1974.*

At all manufacturing processes using oil or oil emulsions for cooling, the occurrence of oil mists is unavoidable. Depending on the development of the oil mists, through evaporation or atomization, the droplet size distribution has its maximum below or above the size of one micron. Drplets developing through atomization may have sizes starting from one micron all the way up to 30 or 40 micron. For separation of oil mists glass fiber filters, electrostatic precipitators, or impactors can be used. The operating prinicples of these separators are outlined briefly. The most inexpensive and simplest separator uses the forces of inertia for separation. The oil-laden air flows through a filter consisting of a mesh of fine wires. The air flow is divided into smallest flows and is constantly forced to change its direction which the oil droplets cannot follow because of their mass so that they impact on the wires and adhere to them. This filter can be used only for oil mists which are developed by atomization. They achieve collection efficiencies of 70 and 80%. Glass fiber filters use the diffusion effect and are suitable for separation of the finest particles, provided the concentration in the air flow is not higher than 100 to 150 mg/cu m. The filter is less suitable for the separation of oil emulsions. Also the air flow should not carry a high dust load. The application of the electrostatic precipitator is less limited and can also be used for oil emulsions. Attention must be paid, however, to the water fraction in the mist.

45643 **APTIC NO. 68495**

Yagi, Shizuo, Isao Fujii, and Toru Hatanaka

CVCC ENGINES. *(CVCC enjin ni tsuite). Text in Japanese. Preprint, Automobile Technical Assoc., Tokyo (Japan), p. 285-291, 1971. (Presented at the Japan Automobile Technical Association Lecture Meeting, Tokyo, Japan, 1974, Paper 39.)*

The geometrical factors and operation factors of CVCC (compound vortex controlled combustion) engines and their effects on emission characteristics are discussed. The structure and functions of the engine, engine emission characteristics, fuel ratio models, the model of end compression stroke, the relationship between fuel ratio and emission characteristics, fuel ratio, and combustion gas temperature are discussed. Various mode operations of CVCC engines and emissions and fuel economy are discussed. Exhaust emissions of American cars with CVCC engines and those of Japanese cars were compared. A low mileage American car with LA-4 modes without the CVCC emits exhaust gases containing 10.6 g/mi of carbon monoxide, 2.13 g of hydrocarbons, and 3.80 of nitrogen oxides. These figures are reduced to 2.62, 0.26, and 1.16, respectively, with the CVCC. With two types of Japanese cars with CVCC engines, these figures are 2.42, 0.24, and 1.38, and 2.12, 0.18, and 0.89, respectively. With a 1488 cc capacity Japanese car with a CVCC engine, emission by manual transmission contains 1.88 g of CO, 0.19 g of HC, and 0.77 of NOx. With automatic transmission, these figures are 1.89, 0.19, and 1.06 g respectively.

45644 **APTIC NO. 68464**

Yamamoto, Tamechika

ENERGY PROBLEM AND METHANOL. *(Enerugi mondai to metanoru). Text in Japanese. Kagaku Kogaku (Chem. Eng.), 38(8):546-549; Aug. 1974.*

Catalysts for producing methanol from hydrogen which are both effective and long-lasting are not currently available. Those which are used are usually converted and with sufficiently heated steam the reaction occurs at 300 C. By eliminating carbon dioxide, hydrogen can be obtained continuously. This process is more easily manipulated and has a higher heating efficiency than other processes for converting hydrocarbons to hydrogen. A fuel battery is a generator that uses hydrogen as fuel and has high energy conversion efficiency (70%). The most promising is a hydrogen-air battery using aqueous alkali solution. Small-scale generating equipment combining hydrogenation of methanol and a fuel battery requires only a small amount of cooling water and is thus exhaust free. Because of this, many batteries can be scattered over an area for electric power production, avoiding the problem of distribution.

45645 **APTIC NO. 69171**

Yamanaka, Tatsuo

THE STATUS QUO OF CATALYSTS TO BE USED FOR PREVENTION OF PUBLIC HAZARD AND SOME PROBLEMS INVOLVED IN THE TREATMENT OF THE REACTIONS. *(Kogai boshi-yo shokubai no genjo to hanno shori- jo no shomondai). Text in Japanese. Kagaku Kojo (Chem. Factory), 18(9):10-15, Sept. 1974. 10 refs.*

The temperature at which carbon compounds start to burn depends on the type of catalysts used. Methane must be treated at 230 to 240 C with palladium-alumina present. Acetylene burns completely at 130 C. The results obtained from combustion of hexane with various catalysts present are presented. The total amount of hydrocarbons in the exhaust gas of vehicles was converted by 82% at 180 C with platinum-alumina present. Carbon in the air can be oxidized at a level of 300 ppm at room temperature with palladium-activated carbon present. The catalytic reduction process is most widely used to treat nitrogen oxides. Hydrogen, carbon monoxide, HC, a mixture of these compounds, and ammonia are used as reduction fuel. Ammonia is effectively treated as a fuel at a temperature in the vicinity of 250 C without being influenced by the presence of oxygen. Platinum, however, lasts only for one year if used in the reaction system. If sulfur dioxide is present, ammonium sulfite is formed by the reaction between SO2 and NH3. An infinitesimal quantity of SO2, however, remains in this case. The sulfur dioxide deprives Pt of its catalytic activity. This is because SO2 is absorbed into Pt in the presence of NH3. Major reasons for decreases in catalytic activity include sintering, formation of compounds by substances depriving catalysts of their activity, and adherence of dust, oil mist, tar, and soot to catalysts.

45646 **APTIC NO. 69009**

Yamasaki, Hiroo

SOOT PREVENTION DEVICE. *(Baien boshi sochi). Text in Japanese. (Yokogawa Electric Appliance Co. (Japan)) Japan. Pat. Sho 49-26533. 4p., July 10, 1974. 1 ref. (Appl. Sept. 13, 1969, 2 claims).*

An invention is described for soot prevention in flare stack gas. The device has the following characteristics: a gas duct for flare stack gas and a steam pipe which sprays steam to the gas; a flowmeter which utilizes the Carman vortex of the gas to measure its flow rate; and a steam flow control system which connects the output signals of the gas flowmeter and the steam regulator. The gas flow rate is measured by the flowmeter which gives the output signal, as frequency proportional to the square of the flow rate, to a converter where it is converted into a analog signal. The analog signal is transmitted to a calculator where the optimal steam rate is calculated. An additional steam regulator, which received the output signal from a steam meter and the calculated result from the calculator, can be used. In this case, a hot stream type or pressure difference type steam meter can be used to replace the Carman vortex type steam meter.

45647 **APTIC NO. 68278**

Zacharia, F. A.

ADVANCED DEVELOPMENT ON STIRLING ENGINES AT M W M. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. 26.1-26.12. 3 refs. (Nov. 4-8, Paper 26.)*

The Stirling engine, an external combustion device with low exhaust emissions, is compared to the diesel engine in terms of size, weight, and cooling system requirements. The two engine types require about the same size and weight to produce a given power output, though the Stirling engine makes greater demands on the cooling system. The quantity of heat to be dissipated in the cooler of a Stirling engine is approximately twice as great as that dissipated in the diesel, calling for twice the cooling surface area or a twofold increase in the specific heat transfer rate in the cooler. An intermittent short circuit control system for the Stirling engine that works on the principle of thermodynamic exclusion of sections of the piston stroke from the cycle promises quick engine response, good efficiency under partial load, and moderate construction costs.

45648 **APTIC NO. 68250**

Zapf, H.

POLLUTANT EMISSION ABATEMENT IN VEHICLE DIESEL ENGINES. *(Verminderung der Schad- und Feststoffemission bei Fahrzeug- Dieselmotoren). Text in German. Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. A5.1.1-A5.1.6. 2 refs. (Nov. 4-8, Paper A5.1.)*

The principle and purpose of the Comprex charger developed by Brown Boveri for diesel engines and the adaptation of the Comprex charger to diesel engines for exhaust testing are described. Reduction of the nitrogen oxides emissions caused by charging, and abatement of the soot emission at acceleration and rapid load changes caused by the pressure wave principle of this charging method are the basic targets of the Comprex charging of diesel engines. Comparative exhaust measurements are being conducted on a diesel engine with and without the Comprex charger according to the 13-step cycle.

45649 **APTIC NO. 69148**

Ziegler, Donald L., Andrew J. Johnson, Louis J. Meile, Alfred L. Johnston, and Elmer L. Shamhart

PILOT PLANT DEVELOPMENT OF A FLUIDIZED BED INCINERATION PROCESS. *Dow Chemical, Golden, Colo., Pilot Plant Dept., Atomic Energy Commission Contract AT(29-1)-1106, Rept. TID-4500-R60, 16p., Oct. 14, 1974. 1 ref.*

NTIS: RFP-2271

Pilot plant scale tests were made on a fluidized bed incineration process under development at the Rocky Flats plant. The hydrogen chloride produced from combustion of chloride-containing plastics reacted with sodium carbonate bed material in the primary combustion chamber. This minimized equipment corrosion and eliminated the need for aqueous scrubbing of the flue gas. A packed bed and a fluidized bed of oxidation catalyst were evaluated for low-temperature afterburning of the flue gas. (Author abstract)

45650 **APTIC NO. 66278**

Environmental Protection Agency, Washington, D. C., Office of the Mobile Source Air Pollution Control

EVALUATION OF ANALUBE SYNTHETIC LUBRICANT. *Rept. 75-1 AWK, 4p., July 1974.*

The Analube synthetic lubricant was evaluated to determine if it reduces exhaust emissions. Analube is formulated from a polyglycol base with a molybdenum compound for lubricity. The lubricant is marketed as a replacement for the normal hydrocarbon motor oils. Six tests were conducted and show: no change for hydrocarbons or nitrogen oxides, a 20% increase in carbon monoxide, and a 4% decrease in carbon dioxide.

45651 **APTIC NO. 68433**

LIQUEFIED NATURAL GAS-POWERED ENGINES FOR AIR POLLUTION ABATEMENT. *(Inquinamento atmosferico e delle acque). Text in Italian. Riv. Combust., 28(4):145-146, April 1974.*

The possibility and environmental advantages of the use of liquefied natural gas as a fuel in spark ignition engines are discussed. Apart from making the engine operation more stable, liquefied natural gas as a fuel has the advantage of containing no sulfur and requiring no lead additive. The exhaust gases from liquefied natural gas-powered engines contain much less carbon monoxide than do gasoline engine exhaust gases, while the nitrogen oxide emission is beyond the emission standard imposed on 1975 cars in the USA. Liquefied natural gas will find its major use in public utility vehicles especially in city traffic.

45652 **APTIC NO. 68472**

DEVICE FOR THE PREVENTION OF HIGH POLLUTANT CONCENTRATIONS NEAR STACKS. *(Vorrichtung zum Verhindern von Immissionen in Schornsteinnaehe). Text in German. Heizung Lueftung Haustech., 25(9):298, Sept. 1974.*

A simple device developed by the British Hydromechanics Research Association and manufactured by Parglas Ltd. of Barton Manor, Bristol, England, for the prevention of the fall of dust emission from stacks especially at wind speeds in the order of magnitude of the discharge flow rate, is described. The device is composed of a hollow truncated cone fastened with its base to the top of the stack. The lower edge of the cone splits the wind stream into two components; with the upper component flowing around the outside of the cone horizontally, entraining the smoke being emitted, while the other component, captured inside the cone, streams downward on the lee side without entraining smoke. The device prevents high ground-level pollutant concentrations at wind speeds up to double the discharge flow rate.

45653 **APTIC NO. 68476**

Tokyo Metropolitan Bureau of Environmental Protection, Japan

BASIC INVESTIGATIONS FOR STACK GAS DESULFURIZATION SYSTEMS (PART I). *(Haien datsuryu sochi no kiso chosa, sono 1). Text in Japanese. 77p., May 1974.*

Investigations were carried out at four plants equipped with average-size desulfurization apparatus. A TS-16B TCA apparatus of sodium sulfite method at a chemical plant used 48% sodium hydroxide solution as absorbent. The reaction temperature was 60 degrees and the absorbent was supplied at 60-70 kg/hr. The flue gas treating capacity was 16,000 N cu m/hr. Sulfur oxides concentration in flue gas was reduced from 784 ppm to 15.3 ppm, a 97.5% desulfurization efficiency. A KBCA BI-200 apparatus of sodium sulfite method at an oil and fat plant used 20% NaOH solution as absorbent. The reaction temperature was 90 degrees and the absorbent was supplied at 33.3 l/min. The flue gas treating capacity was 15,000 N cu m/hr. Sulfur oxides concentration in flue gas was reduced from 463 ppm to 77.9 ppm, an 81.7% desulfurization efficiency. An apparatus for lime-lime sulfite method at a gypsum plant treated 12,000 N cu m/hr flue gas at 55-60 degrees with calcium sulfite as by-product. Sulfur oxides concentration in flue gas was reduced from 1160 ppm to 6.6 ppm, a 99.4% desulfurization efficiency. A KBCA BI-200 apparatus for ammonium sulfate method at a dyeing plant treated 20,000 N cu m/hr flue gas at 50-60 degrees with 1 ton/wk of ammonia gas. Sulfur oxides concentration was reduced from 1004 ppm to 123 ppm, an 87.7% desulfurization efficiency.

45654 **APTIC NO. 68487**

THE TRANSISTOR SPARK IGNITION DEVICE IN THE SPOTLIGHT. *(Wadai no toranshista tenka sochi). Text in Japanese. Jidosha to Seibi (Automob. Maint.), 28(9):34-41, Sept, 1974.*

The main difference between the electronic transistor ignition system and the conventional Kettering ignition system is the pointless system. The transistor system includes the semi-transistor system and the full transistor system. In the semi-transistor system, the contact breaker of the Kettering system is used as it is, however, the amount of current passed is extremely small. The wearing of points is reduced, but the chattering of points at super high speed cannot be eliminated completely. In the full transistor system, instead of using the contact breaker and points, the pulse generator is used, in which the electric potential is induced in the ignition coil by the variation in flux of magnetic induction. The mechanism of the full transistor system is described with circuit diagram, schematic diagram, and photos. The merits of the transistor system, the maintenance free mechanism, elimination of the chattering phenomenon of points, and resulting high performance are discussed. The method of installing the ultra-pointless ignition system manufactured by Nagai Electronic Equipment Co. is described in detail with diagrams.

45655 **APTIC NO. 68609**

Environmental Protection Agency, Washington, D. C., Div. of Stationary Source Enforcement

FLUE GAS DESULFURIZATION. INSTALLATIONS AND OPERATIONS. *30p., Sept. 1974.*

The status of power plant compliance with sulfur oxide air pollution emission limitations is discussed. Flue gas desulfurization technology must be installed on large numbers of power plants if SOx emission requirements adopted pursuant to the Clean Air Act are to be met in the 1970 s. The status of flue gas desulfurization installations is reviewed. The number of such installations which are operational, under construction, or otherwise committed to equals 93 systems at 51 plants by 39 utilities. Nineteen units are now operating. The flue gas desulfurization plants will use limestone, lime, magnesium oxide, catalytic oxidation, Wellman-Lord, aqueous sodium, dry absorption double alkali, or other desulfurization processes. The status and operational experience of plants now operating or under construction are discussed, and planned plants are listed.

45656 **APTIC NO. 68697**

Tokyo Metropolitan Bureau of Pollution Control

BASIC INVESTIGATIONS CONCERNING NITROGEN OXIDES CONTROL MEASURES. *(Chisso sankabutsu taisaku ni kansuru kiso chosa). Text in Japanese. Kankocho Kogai Senmon Shiryo (Public Nuisance Gaz.), 9(5):36-58, Sept. 1974.*

Questionnaires were given to more than 100 companies developing new new nitrogen oxides prevention techniques. Among them, 8 companies were selected for hearing and 6 were chosen for further investigation of their techniques. The R type burner of A company used recycled combustion gas to burn incoming fuel which was further burned by high temperature air. The RO type burner was an improved R type with short contact of the recycled combustion gas with fuel. The NPL type burner of B company was a self-recycling type using the suction caused by gas injection. The flame-diversifying burner of D company used a flame tip to separate a flame into smaller flames. The TPW type burner of E company had a diffractor at the end of the burner gun and recycling of combustion gas was caused by diffraction. The APOC-HP-1 type burner of F company was a two-stage burner in which combustion gas recycling was caused by a high speed hot stream. The NOx was reduced up to 50% by some of the above burners compared to the conventional methods.

45657 **APTIC NO. 68933**

Stauffer Chemicals Co.

POWERCLAUS. SULFUR DIOXIDE ABATEMENT SERVICE. (PRELIMINARY REPORT). *15p., Feb. 14, 1974.*

The Powerclaus process for effectively desulfurizing stack gases to levels below present and anticipated emission standards is described. The sulfur dioxide abatement process was tested at a pilot plant for more than 1 year. The process reduces SO2 to elemental sulfur. It is economically attractive, uses conventional materials and operations, and can be used to treat Claus tail gas. The process consists of gas treatment and SO2 absorption, sulfur recovery in a liquid phase reaction with hydrogen sulfide, and generation of H2S in a H2S production facility utilizing part of the recovered sulfur. The process can treat flue gas containing less than 100 ppm by volume of SO2. Levels as low as 50 ppm of SO2 in the final effluent gas have been demonstrated in pilot plant tests. Costs are cited.

45658 **APTIC NO. 68991**

Chiyoda Chemical Engineering Construction Co., Ltd.

THOROUGHBRED 101. *(Sarabureddo 101). Text in Japanese. Kagaku Kojo (Chem. Factory), 18(7):62-63, July 1974. 2 refs.*

A desulfurizing process in which sulfurous acid gas absorbed by diluted sulfuric acid is oxidized by the air with iron catalysts, ultimately yielding gypsum is described. Stack gas sent by means of an air-blower is cooled to a temperature of 50 to 80 C (suitable for the oxidized absorption process due to the latent heat of water evaporation in the cooler) and sent to the absorption tower. Stack gas, eliminated by contact with dilute sulfuric acid of 2-10 wt%, is discharged through the reheater into the air. Dilute sulfuric acid is sent to the oxidizing tower by a pump from the absorbing tower after absorbing sulfurous acid gas, which is ultimately converted to sulfuric acid by means of oxidation with catalysts present in the oxidizing tower. A part of the sulfuric acid produced is recycled into the absorbing tower while the rest is sent to the crystallizing tank through the sulfuric acid tank. Manganous ion is available for the reaction in which sulfurous acid is converted to sulfuric acid. It, however, loses activity since it is affected by heavy metals in gas. Instead iron catalyst is used in this process. It shows small activity at a low temperature, but roughly the same activity as that of manganous ion at a temperature from 50 to 70 C.

1973

45659 **APTIC NO. 68866**

Altenkirch, R. A. and A. M. Mellor

EMISSIONS AND PERFORMANCE OF GAS TURBINE LINERS. I: STABILITY (INTERIM REPORT). *Purdue Univ., West Lafayette, Ind., Combustion Lab., General Motors Corp. Detroit Diesel Allison Div. Purchase Order H240959, Rept. PURDU-CL-73-05, 66p., Nov. 1973. 40 refs.*

Low pollution gas turbine engines are being studied for use in aircraft and automobiles. Physical and mathematical combustor models are not presently available for use in predicting the performance and emission characteristics of gas turbine combustors. Models do exist for continuous flow combustors. Since low emission combustors generally prevaporize the fuel and premix it with air, a relatively simple prevaporizing combustor utilizing bluff body flame stabilization was studied. Liquid fuel vaporization is accomplished in the combustor volume upstream of the flameholder. Experimental results obtained for the combustor described are analyzed following a brief review of the literature on bluff body flame stabilizers. Lean stability limits plotted via the correlative procedure of Spalding and Tall indicate that the vaporization section is adequate and the combustor is approaching a bluff body flame stabilizer in a homogeneous fuel-air stream. Use of the stability theory of Longwell, in which the recirculation zone is considered a well stirred reactor, in conjunction with the stability data, leads to the conclusion that in a conventional bluff body flameholder the recirculation zone residence time is too long to govern stability. Residence time in the shear layer next to the recirculation zone is dominant for stability purposes in agreement with the theory of Zukoski and Marbel. A measure of the residence time in the recirculation zone is calculated from the procedure of Gosman for recirculating flows. The order of this time is checked by assuming the recirculation zone is a well stirred reactor and by kinetically calculating nitric oxide and carbon monoxide levels in the reactor as a function of residence time. Comparison of the calculations with preliminary concentration measurements in the recirculation zone showed good agreement. The possibility of simultaneously reducing emissions and increasing stability is discussed. One method of reducing NO in the recirculation zone and increasing stability is presented. (Author abstract modified)

45660 **APTIC NO. 62256**

Archer, D. H., D. L. Keairns, E. J. Vidt, and L. W. Zahnstecher

A PRESSURIZED FLUIDIZED-BED BOILER DEVELOPMENT PLANT. *Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd, 1973, p. V-3-1 to V-3-23, EPA-650/2-73-053. 2 refs. (Dec.)*

NTIS: PB 231977/AS

Preliminary designs were prepared for a 30-MW pressurized fluidized bed combustion boiler development plant. Such a plant is needed to further the development of a power generation concept which promises reduced costs for electrical energy and reduced emissions of sulfur dioxide, nitrogen oxides, and particulates from the use of coal and oil. The designs, experimental program, schedule, and budget will be useful in studying technical problems, planning the development of fluidized bed combustion power plants, and forming a development team. Information received from the laboratory and pilot plant in 1973 and 1974 can be used to improve the development plant equipment design and experimental program. The formation of a team to implement the development plant program should be accomplished during 1973. Detailed design, construction, and operation of this plant are recommended for the 3-year period 1974-1976 in order that a demonstration pressurized fluidized bed combustion boiler power plant can be built and operated before the end of the decade. (Author abstract)

45661 **APTIC NO. 68916**

Bridge, A. G., E. M. Reed, P. W. Tamm, and D. R. Cash

CHEVRON ISOMAX PROCESSES DESULFURIZE ARABIAN HEAVY RESIDUA. *Preprint, American Inst. of Chemical Engineers, New York, 35p., 1973. 12 refs. (Presented at the American Institute of Chemical Engineers, National Meeting, 74th, New Orleans, La., March 11-15, 1973, Paper 14a.)*

The Isomax processes for desulfurizing vacuum gas oils, whole and topped crudes, and atmospheric and vacuum residua are described. Characteristics of Arabian heavy crude fractions, pilot plants for various Isomax processes, atmospheric residuum desulfurization (RDS) and desulfurization of vacuum residuum (VRDS) design considerations, and economics of RDS and vacuum gas oil/VRDS processing of Arabian Heavy crude are discussed. Pilot plant data show that desulfurization of residua from Arabian Heavy crude is technically feasible down to 0.5% of the sulfur fuel oil pool level. Processes for both atmospheric and vacuum residua have been demonstrated in the laboratory in long pilot plant runs over catalysts designed with knowledge of the kinetics of the demetalation reaction and the influence of pore diffusion on the kinetics. Process reliability is improved by giving special design attention to minimizing pressure drop buildup and ensuring a stable product at all times. The economic comparison of VGO/VRDS Isomax processing with RDS Isomax shows an advantage for the two-plant processing scheme. This is because of more efficient utilization of hydrogen due to the more optimum processing conditions employed in each plant. (Author summary modified)

45662 **APTIC NO. 66495**

Chaddock, Jack B.

INDOOR AIR QUALITY AND ITS CONTROL THROUGH AIR CONDITIONING--PART 1. *Aust. Refrig., Air Cond., Heat., 27(6):13-17, June 1973. 1 ref. (Presented at the Australian Refrigeration, Air Conditioning and Heating Conference, Sydney, Australia, 1973.)*

Air conditioning can reduce indoor pollution to some extent. Although it is well known that air conditioning can remove particulates and odors, there is some question as to its effectiveness in reducing gaseous pollutants. Several studies were conducted by ASHRAE to clarify this point. These research programs are reviewed, and the ASHRAE research policy is discussed. Results of the studies showed that usually air conditioners are effective, depending on the type of control method used in the conditioner, such as electrostatic precipitators or scrubbers.

45663 **APTIC NO. 68594**

Coates, Neil H. and Richard L. Rice

SULFUR DIOXIDE REDUCTION BY COMBUSTION OF COALS IN FLUIDIZED BEDS OF LIMESTONE. *Preprint, American Inst. of Chemical Engineers, 18p., 1973. (Presented at the American Institute of Chemical Engineers, National Meeting, 75th, Detroit, Mich., June 3-6, 1973.)*

Sulfur dioxide reduction was tested with various coals as fuel in fluidized beds of limestone. Sulfur retention and heat transfer were measured. The program involved testing five types of bituminous coal from high volatile A to low volatile, which varied in ash content from 8 to 24% and in sulfur content from 2 to 4%. At a fluidizing velocity of 3 ft/sec and when fines from the primary cyclone were recycled to the bed, S retention by a limestone bed increased rapidly to 90% as the calcium/sulfur ratio increased to approximately two. At 6 ft/sec and without recycle, it appeared that Ca/S was at least three to retain 90% of the S in the bed. Carbon burnup was too low for commercial boiler operation when recycle was not employed, regardless of the fluidizing velocity. Even when recycle is used at the lower velocity of 3 ft/sec, carbon burnup might not be commercially acceptable, so that a seperate burnup cell is required. At 3 ft/sec fluidizing velocity, using beds ranging from 8 by 28 mesh to 3/8 in. by 3/16 in., the heat transfer coefficient from the bed to a tube immersed in the bed was 60-70 Btu/hr/sq ft F. At a velocity of 6/ft/sec and with beds of 1/4 in. by 3/16 in. particles, the coefficient to steam-cooled and water-cooled tubes were 43 and 32, respectively. (Author conclusions modified)

45664 ***APTIC NO. 64635***

Davis, Stephen R. and Naeim A. Henein

COMPARTIVE ANALYSIS OF STIRLING AND OTHER COMBUSTION ENGINES. SAE (Soc. Automot. Engrs.) Spec. Pub., no. 379:36-47, March 1973. 31 refs.

The Stirling engine is being studied because of its low level of gaseous and noise emissions and its high thermal efficiency. The cycle is analyzed thermodynamically, and combustion and performance characteristics are described. The main drawbacks of the Stirling engine are its high weight-to-power ratio, the need for special heat-resistant alloys to stand the high pressure and temperatures in the combustion zone, and the high thermal loads on the cooling system. The thermal efficiency, power output, and specific power of the Stirling engine increase with the reduction in the coolant temperature, with the increase in the maximum cycle temperature and mean cycle pressure, and with the use of hydrogen instead of helium. The specific power of the Stirling may be increased by using the V-shaped multicylinder design with one combustor, by applying the double-acting principle, and by increasing the engine speed. The latter is limited by the heat transfer rate and fluid friction losses. The carbon monoxide and unburned hydrocarbon emissions from the Stirling engine are loer than those of most of the other cyclic and continuous combustion engines. The nitric oxide emission from the Stirling engine is lower than that from the gasoline and diesel engines and is nearly the same as in the gas turbine. Further design changes in the Stirling engines would reduce the NO emissions. Exhaust gas recirculation is an effective way of reducing the NO emissions from the Stirling engine. (Author conclusions modified)

45665 **APTIC NO. 69102**

Fekete, Sandor

LABORATORY INVESTIGATIONS FOR THE SEPARATION AND UTILIZATION OF SULFUR DIOXIDE PRESENT IN INDUSTRIAL WASTE GASES. *(Ipari hulladekgazok SO2-tartalmanak levalasztasara es hasznositasara vegzett laboratoriumi vizsgalatok). Text in Hungarian. Banyasz. Kohasz. Lapok, Banyaszat, 106(7):461-467, 1973. 10 refs.*

Laboratory and pilot tests on the use of sulfur dioxide- containing power plant flue gases for the recovery of manganese from ores with low manganese content are described. Slurries of crushed ore, containing glauconite, radocrosite, dolomite, limestone, pyrolusite, limonite, and quartz were contacted with power plant flue gas containing 0.3 to 0.5% SO2 by volume. The manganese dioxide present in the slurry became converted to manganous sulfate and then dissolved due to the formation of free sulfuric acid. The rate of desulfurization was 90%, and a manganese output of over 90% was achieved in laboratory tests. In pilot tests with foam columns, a manganous oxide output of over 60% was achieved. The manganous sulfate present in the slurry was precipitated by the addition of calcium hydroxide and water to obtain manganous oxide. The specific cost of the flue gas desulfurization by this method, with consideration for the recovered manganese, amounts to less than $1.5/ton of coal.

45666 **APTIC NO. 68750**

Foksha, G. A., A. M. Chukhvichev, N. I. Kobyakova, D. V. Sokol skiy, N. M. Popova, G. A. Shchelkina, and G. K. Alekseyeva

CATALYTIC CLEANING OF GAS EMISSIONS FROM THE PETROCHEMICAL INDUSTRY. *(Kataliticheskaya ochistka gazovykh vybrosov neftekhimicheskogo proizvodstva). Text in Russian. Vestn. Akad. Nauk Kaz. SSR, 29(10):28-32, 1973. 9 refs.*

The suitability of different catalysts for the oxidation of organic compounds in waste gases generated in synthetic fatty acid and bitumen production, and for the oxidation of carbon monoxide generated during the regeneration of aluminosilicate catalyst used in the catalytic cracking process was studied in pilot plant, using technological waste gases. Activated manganese ore as a catalyst achieved an oxidation efficiency ranging from 70 to 100% at a temperature of 470 C and a bulk speed of 20,000-40,000/hr for the waste gases from synthetic fatty acid production containing aldehydes, ketones, acids, alcohols, and esters in an overall concentration of 8-15 g/cu m. Another catalyst containing 0.05% palladium and 0.5 cerium on alumina carried proved to be less effective. The activated manganese ore catalyst had an efficiency of 70-100% for waste gases from bitumen production, containing 25-55 g organic compounds, 7-9 mg phenols, 0.05-0.1 mg hydrogen sulfide, and 9-10 mg mercaptans per cu m. The bulk speed varied from 20,000 to 28,000/h. Carbon monoxide, present in the cracking gas in a concentration of 3% by volume, was quantitatively oxidized by a catalyst with 0.5% palladium on alumina spheres in a temperature range of 540-550 C.

45667 **APTIC NO. 68581**

Glukhomanyuk, A. M. and V. N. Akelsandrov

PURIFICATION OF INDUSTRIAL GASEOUS EMISSIONS FROM THE MANUFACTURE OF ANTIBIOTICS. *(Ochistka promyshelennykh gazovykh vybrosov priozvodstva antibiotikov). Text in Russian. Khim. Tekhnol., no. 4:13-15, 1973.*

The catalytic oxidation of malodorous gaseous emissions from streptomycin production was studied, and a pilot plant for such odor control was developed. Of all the catalysts tested, such as pyrolusite, palladium, cerium-palladium, copper-manganese, palladium-cobalt, and iron-copper oxide on gamma alumina, cerium- palladium copper-managanese, and palladium catalysts were the most efficient, providing for nearly quantitative oxidation of methane as an added indicator substance at 350-400 C at a space load of 20,000-30,000 per hour. The activity of cerium-palladium and palladium catalysts decreased by 30-35% after 1200 hours of operation, while there was practically no change in the activity of pyrolusite after 5000 hours. A pilot plant catalytic incinerator with pyrolusite as catalyst was developed for the destruction of malodorous emissions from streptomycin production. The waste gases heated to 300-500 C by means of natural gas were admitted to the catalyst chamber for oxidation to carbon dioxide and water.

45668 **APTIC NO. 68797**

Gyss, M.

TECHNOLOGICAL DEVELOPMENT OF ENGINES. *(Evolution des moteurs: aspect technique). Text in French. Rev. Ass. Fr. Tech. Petrole, no. 221:100-104, 1973.*

The state of the art and future trends in the design development of internal combustion engines with respect to emission abatement are surveyed. The joint reduction of CO and hydrocarbon emissions is possible by reducing advanced ignition to give lean mixtures, by combustion air preheating, and by modifications of the geometry of the combustion chamber and of the carburetor design. Exhaust gas afterburning with auxiliary air admission also lowers the CO and hydrogen emissions. Simultaneous reduction of the CO, nitrogen oxides, and hydrocarbon emissions is possible by increasing the camshaft overlap or by exhaust gas recirculation. Thermal reactors, and especially catalytic reactors containing nickel, chromium, copper, manganese, or platinum, and palladium oxides are envisaged for use in automobiles to meet the exhaust emission standards. The control of nitrogen oxides emissions requires the use of reducing catalysts. Particulate separators having efficiencies of up to 95% for lead particles are unable to sufficiently protect catalytic reactors. Stratified-charge engines emit reduced amounts of hydrocarbons, nitrogen oxides, and CO, and rotary engines provide for low nitrogen oxides emissions at the expense of unburned hydrocarbons.

45669 **APTIC NO. 68885**

Heinemann, Heinz

CATALYTIC EXHAUST CONTROL. (Soluciones cataliticas a la contaminacion por automoviles). Text in Spanish. Quim. Ind. (Bilbao), 19(9):526-529, Sept. 1973. 10 refs. (Presented at the EUCHEM Conference.)

Recent achievements and problems in the development of exhaust control devices in the USA are reviewed. To meet the 1976 emission standards, catalytic systems for the oxidation of carbon monoxide and hydrocarbons, and for the reduction of nitrogen oxides to nitrogen and water are needed. While oxidizing catalysts using platinum, palladium, copper vanadium, and chromium applied on alumina or ceramic materials are more or less effective in emission control, there are no catalytic devices for the reduction of nitrogen oxides with the required useful life of 25,000-50,000 miles as yet available. In the case of platinum catalysts or monolithic supports, the operating temperature of 650-750 C as required for the oxidation process may cause inactivation of the catalysts and fusion of the support material. The oxidation of C0 and hydrocarbons is inhibited by high concentrations of C0, nitric oxide, and hydrocarbons. The use of catalytic converters requires the use of lead-free or low- lead gasoline. The nitrogen oxides conversion efficiency is considerably influenced by the oxygen-to-C0 ratio of the exhaust gas, which makes limitation of this ratio necessary.

45670 **APTIC NO. 68649**

Heitner, Kenneth and Randall G. Williams

ANALYSIS OF AN EVAPORATIVE CONTROLS RETROFIT PROGRAM FOR THE SOUTH COAST AIR BASIN. *California Inst. of Tech., Pasadena, Environmental Quality Lab., National Science Foundation Research Applied to National Needs Grant 29726, EQL TM 3, 39p., May 1973. 7 refs.*

NTIS: N74-22407

The feasibility and cost of an evaporative control retrofit program the California South Coast Air Basin are analyzed for the pre-1970 vehicle population. The task involves controlling both the breathing and running losses from the fuel tank and carburetor as well as hot soak loss from the carburetor when the engine is turned off. Case studies of various vehicle types involving the creation of a suitable retrofit technique for each sample vehicle are presented along with estimates of labor and component costs. Retrofit modifications include: fuel tank changes, replacement or rebuilding of the carburetor, and installation of charcoal cannister devices. A retrofit procedure with the following characteristics appears feasible: a $125 price limit for individual retrofit systems, a maintenance price limit of $5 per 10,000 mi or 1 year, and 65% coverage of the pre-1970 vehicle population of the South Coast Air Basin.

45671 **APTIC NO. 68993**

Katayama, Nobuo and Ko Fujii

OPERATION OF THE NEW ISOMAX APPARATUS OF UOP RCD. *(Saikin no UOP RCD isomax sochi no unten ni tsuite). Text in Japanese. Kagaku Keizai (Chem. Ind. Econ.), 21(11):28-32, Oct. 1973.*

The history and experience of continuous operation for 1 year of the UOP RCD isomax apparatus is reported. The No. 1 machine of the UOP Corp., which practices the RCD isomax method, was installed in the Chiba refinery of Idemeitsu Kosan Co., Ltd., and started operation in autumn, 1967. The No. 2 machine was installed in Kuwait (?), and the No. 3 machine was installed in the Kashima Petroleum Co., and started operation in 1970. This machine was continuously operated for 1 yr. This machine was originally designed to desulturize residual oil, which remains after distillation at ordinary pressure. The raw oil used for the distillation is that obtained from Kuwait. The sulfur content in the residual oil is 4.0 wt%. The machine reduces the sulfur content down to 1.0 wt%. The designed capacity of pretreatment is 45,000 BPSD. The RCD-5 catalyst was used for continuous operation. The pressure drop of the reaction tower was 40 psi all through the year. Important factors that affected the operating efficiency were impurities in the raw oil such as heavy metals, asphalthene, and fine particles, the performance of the catalyst, and the efficiency of attached apparatuses, such as sulfur recovery apparatus and hydrogen producers.

45672 **APTIC NO. 68855**

Killackey, J., R. Morgan, C. Morse, B. Foster, and C. Lee

CONDENSER AND FAN DEVELOPMENT FOR RANKINE CYCLE ENGINES. *AiResearch Mfg. Co., Torrance, Calif., Office of Air and Water Programs Contract 68-01-0407, EPA-460/3-73-007, AiResearch Rept. 73-9034, 219p., Nov. 1973. 3 refs.*

NTIS: PB 232502/AS

Condenser size and cooling air fan power consumption are two significant factors that limit the application of Rankine cycle power systems to automobiles. Therefore, a program was initiated to develop a high performance condenser and fan system for each of three Rankine cycle automotive power plants being developed. The three condenser and fan assemblies were fabricated, leak checked, performance tested, and delivered to the three system contractors. Final specifications for each system are presented, and the designs are discussed. The results of various performance tests are given. Air flow tests revealed that the airflow through the Steam Engine Systems unit was slightly higher than predicted, while the airflow through the Thermo Electron unit was 9% lower than predicted over the fan speed range. The air-side perforated fin geometry appeared to be close to optimum for this application. Vapor-side heat transfer performance should be as predicted based on the condensing heat transfer test results. Fluxless brazing was established as a practical fabrication method for the condenser plate-fin core assembly. The cooling air fans met all performance requirements including air efficiency goal of greater than 70%. The measured noise levels were exceptionally low. Airflow pressure losses measured in the engine installation mockup were less than expected. (Author abstract modified)

45673 **APTIC NO. 68652**

Krueger, Berthold

WET PURIFICATION OF CONVERTER WASTE GASES CONTAINING LIME AND CARBON DIOXIDE BY ADDING ALKALI CARBONATE OR BICARBONATE TO WASH WATERS. *(Verwendung von Alkalisalzen als Zusatzmittel zu Waschwasserkreislaeufen fuer die Nassentstaubung von Gasen). Text in German. (Gottfried Bischoff Bau Kompl. Gasreinigungs und Wasserrueckkuehlanlagen KG, Essen (Germany)) W. Ger. Pat. Appl. 2,350,956. 2p., Oct. 11, 1973. (3 claims).*

Alkali carbonates and/or bicarbonates, especially soda, are used as additives (I) for wash water cycles in wet-separation of dusts from gases containing calcium oxide particles and carbon dioxide, especially converter waste gases, by a process where contaminated water is recycled, after settling and elutritiation of solids, with replenishment of fresh water and (I), to inhibit solubilization of Ca from the CaO particles. Preferably 0.2-2 (0.4-1) g/l carbonate is maintained in the washwater cycle. The alkali salts may be replaced partly by alkali hydroxide, depending on the CO2 content of the gas.

45674 **APTIC NO. 68619**

Mengelkamp, R. A. and R. E. Linnard

GETTING PERFORMANCE WITHOUT SACRIFICING ECONOMY OR EMISSIONS CONTROL IN A HEAVY-DUTY LPG ENGINE. *Preprint, Society of Automotive Engineers, Inc., New York, 15p., 1973. 9 refs. (Presented at the Society of Automotive Engineers, National Combined Farm, Construction and Industrial Machinery and Fuels and Lubricants Meetings, Milwaukee, Wis., Sept. 10-13, 1973, Paper 730803.)*

A commercial 637 CID liquefied petroleum gas (LPG) engine was evaluated as a candidate powerplant for new bus purchases and/or as a replacement for obsolete LPG engines currently being used in metropolitan Chicago bus service. Limited route service experience with LPG conversion of a gasoline engine indicated both its potential and the need for its optimization in order to take advantage of the unique characteristics of LPG. The engine-dynamometer study, with emphasis on fuel system-ignition relationships, led to substantial improvement in fuel economy without depreciation of engine power. The 637 CID LPG engine fuel economy was increased from an average of 1.77 mpg for 1965-1971 to 2.60 mpg for the Dec. 1971-April 1972 period in Chicago field tests. Cylinder head redesign permitted lean mixture operation that reduced exhaust emissions to levels calculated to conform to the 1973 Federal standards and the 1973- 1974 California Air Resources Board requirements for heavy-duty engines. The exhaust emissions data obtained with the optimized 7.5:1 CR engine based on the California 13-mode cycle were 8.3 g/bhp/hr carbon monoxide and 9.9 g/bhp/hr hydrocarbons plus nitrogen dioxide. (Author abstract modified)

45675 APTIC NO. 68537

Miyamoto, Noboru, Masayuki Kamio, Tadashi Murayama, and Shoichi Fukazawa

STUDIES ON LOW COMPRESSION RATIO DIESEL ENGINE (4TH REPORT, EFFECTS OF AUXILIARY INJECTION). ***Bull. JSME (Japan Soc. Mech. Engrs.), 16(102):1947-1959, Dec. 1973. 10 refs.***

In order to realize a low compression ratio diesel engine, the problematic points such as the engine noise resulting from the maximum rate of pressure rise and exhaust emission (nitrogen oxide) must be improved. Auxiliary fuel injection was tested using a direct injection engine for improving these areas, and some factors affecting the effects of the auxiliary fuel injection such as the combustion configuration and thy compression ratio were studied. The auxiliary fuel injection in the low compression ratio engine was a favorable means of suppressing the emission of noise and nitrogen oxides; the optimum timing of auxiliary fuel injection was near the top dead center of the exhaust stroke, i.e., Vigom injection, with respect to specific fuel consumption and noise emission. The extent of the effects of auxiliary fuel injection with respect to improving the maximum rate of pressure rise was intensive, since the injection rate of the main injection was large and the turbulence in the combustion chamber was strong. The effects of auxiliary fuel injection on the relationships between the compression ratio and the effects of auxiliary fuel injection were intensive at lower compression ratio with respect to the maximum rate of pressure rise and noise emission. The adoption of auxiliary fuel injection in a low compression ratio engine consequently may be very effective. (Author abstract modified)

45676 APTIC NO. 68910

Nebel, Carl, William J. Lohr, Harold J. O Neill, and Thomas C. Manley

INDUSTRIAL ODOR CONTROL BY OXIDATION WITH OZONE. ***Preprint, 20p., 1973 (?). 13 refs.***

Ozone is the most powerful useful oxidant known. It can be generated on-site from air, electricity, and cooling water and used to oxidize odors. Methods of obtaining ozone from air by ozonators are discussed. Ozonators are simple to operate, easy to install, and simple to maintain. Ozone can be used to eliminate odors from sewage treatment plants. Ozone, diluted in air, is added to the exhaust system containing odor-forming compounds. Elimination of the odor is accomplished by chemical oxidation of the odor by ozone. Ozone is not a masking agent, and does not replace one odor with another. Most odors are associated with molecules which have centers of high electron density such as amines, sulfides, and unsaturated hydrocarbons. Ozone most often reacts chemically as if it were an electron deficient molecule. Thus, a molecule having a site of excess electrons, i.e., the odoriferous molecule, is attracted to a molecule which is deficient in electrons, ozone. The two molecules interact chemically to produce compounds which do not possess any odor, usually oxides and oxygen. In many instances, the feasibility of ozone oxidation of various odors can be established in the laboratory by duplication of the actual odor. An ozone pilot contact chamber is described and discussed. Various odor control applicatons are discussed including rendering plants, cooking, fermentation, rubber plants, fish processing, phenolic resins, pulp mills, and compost processing. Ozone oxidation has low operating cost, low maintenance, ease of operation, does not require restrictions on the exhaust duct or stack, and can be tested by a pre-installation evaluation before any capital expenditures.

45677 APTIC NO. 62288

Nutkis, M. S. and A. Skopp

DESIGN OF A FLUIDIZED-BED MINIPLANT. ***Environmental Protection Agency, Washington, D. C., Control Systems Lab., Proc. Int. Conf. Fluid. Bed Combust., 3rd, 1973, p. V-2-1 to V-2-18, EPA-650/2-73- 053. 2 refs. (Dec.)***

NTIS: PB 231977/AS

Fluidized bed combustion of coal offers potential both as an efficient compact combustion boiler system and as an air pollution emissions control system. A system was designed capable of fluidized bed coal combustion and desulfurization with continuous limestone regeneration. The miniplant operates at pressures up to 10 atm and with an input of approximately 6.3 times 10 to the 6th Btu/hr. This energy input is equivalent to a power plant rated at 635 kW. Combustion and heat transfer to tubes take place in a reactor containing a fluidized bed of limestone at 1500-1700 R, providing good heat transfer and an efficient desulfurization reaction between the sulfur dioxide and limestone. The calcium sulfate produced during desulfurization is transferred to an adjacent fluidized bed reactor and contacted with a reducing gas at 1980-2050 F. This regenerates the lime and produces a by-product off gas stream of concentrated SO2. Thus, regeneration minimizes the limestone feed requirements and the CaSO4 disposal problems. The fluidizing air enters a plenum in the combustor, passes through the distributing grid, passes up through the fluidized bed, and the combustion products discharge through two refractory cyclones in series. Coal and makeup limestone are fed continuously from a system designed for controlled solids feeding under pressure. Solids transfer between reactors and discharge of solids from the system are accomplished using a pulsed gas transport technique controlled by pressure differentials across and between these fluidized beds. (Author abstract modified)

45678 APTIC NO. 68769

Radusch, Paul

PROCESS FOR THE PURIFICATION OF RAW COKE-OVEN GASES. ***(Verfahren zur Reinigung von Kokerei-Rohgasen). Text in German. (Heinrich Koppers GmbH, Essen (Germany)) W. Ger. Pat. 1,669,326. 5p., April 19, 1973, 1 ref. (Appl. March 4, 1971, 5 claims).***

Coke oven gases are cleaned according to the principle of ammonia circulation scrubbing with the ammonia which is removed being used for simultaneous removal of hydrogen sulfide. The cooled crude gas, liberated from all tar, is passed upward through a multi-stage gas scrubber whose uppermost stage is supplied with ammonia-containing condensate obtained at the preceding cooling process. The gas leaving the scrubber is treated with water or ammonium sulfate to reduce the residual NH3 content to 0.01 g/cu m gas.

45679 APTIC NO. 68751

Temple-Pediani, R. W.

EFFECT OF PRE-INJECTION FUEL TEMPERATURE UPON DIESEL ENGINE IGNITION DELAY AND SOOT EMISSION. ***Proc. Inst. Mech. Engrs. (London), 187(32):395-404, 1973. 19 refs.***

The effect of pre-injection fuel temperature on ignition delay and soot emission was investigated for a diesel engine running on diesel oil. A smoke meter tapped into the exhaust system well downstream of the engine recorded the mean soot emissions from the four cylinders of the test engine. Minimum soot emission was obtained at 3000 rpm and fuel temperatures between 165 and 175 C, with as little as 60% of the normal soot being obtained. Minimum soot emission was obtained between 145 and 150 C at an engine speed of 4000 rpm. Optimization of injection equipment and levels of air swirl should allow improvement in the results obtained in the experiments. Higher than normal fuel temperatures, however, may require the static (in between injection) fuel pressure in the pump and lines to be elevated sufficiently to prevent vapor formation there.

45680 **APTIC NO. 68405**

Scott Research Labs., Inc., San Bernardino, Calif.

A STUDY OF MANDATORY ENGINE MAINTENANCE FOR REDUCING VEHICLE EXHAUST EMISSIONS. VOLUME II. MANDATORY INSPECTION/MAINTENANCE SYSTEMS STUDY (FINAL REPORT). *Coordinating Research Council, Inc. and Environmental Protection Agency Contract, APRAC Proj. CAPE-13-68, Rept. EPA-460/3-74-010-b, 50p., July 1973.*

NTIS: PB 225025/9AS

The results of a computerized model of mandatory inspection and maintenance for reducing vehicle exhaust emissions are presented. The most cost-effective procedure for regions characterized by a photochemical smog problem involves a state-operated emission inspection made with the engine operating under load, followed by idle adjustment and ignition tune-up. The most comprehensive photochemical smog oriented inspection and maintenance procedure studied yields hydrocarbon, carbon monoxide, and nitrogen oxide reductions of 10, 6, and minus 1%, respectively. The most cost-effective procedure for regions characterized by a CO problem involves a franchised garage idle inspection and adjustment program along with the mandatory replacement of the air cleaner and positive crankcase ventilation valve. Hydrocarbon, CO, and NOx reductions of 6, 11, and minus 2%, respectively, are achieved with the most comprehensive CO oriented inspection and maintenance procedure studied. The most cost-effective inspection interval is yearly, regardless of the inspection and maintenance procedure selected. Vehicle rejection rates on the order of 40-60% are required to achieve reasonable emission reductions. The figure of merit (discounted total program cost divided by the weighted 5-year reductions of emissions) of inspection and maintence procedures is sensitive to the following factors (given in rank order of importance): regional characteristics of air pollution, garage maintenance effectiveness, rate and extent of emission and engine adjustment deterioration, vehicle population characteristics, extent of voluntary maintenance, frequency of inspection and repair, costs of unnecessary repair, and inspection accuracy. (Author summary modified)

45681 **APTIC NO. 68410**

Scott Research Labs., Inc., San Bernardino, Calif.

A STUDY OF MANDATORY ENGINE MAINTENANCE FOR REDUCING VEHICLE EXHAUST EMISSIONS. VOLUME VII. A USER S MANUAL AND GUIDE TO THE ECONOMIC EFFECTIVENESS COMPUTER PROGRAM (FINAL REPORT). *Coordinating Research Council, Inc. and Environmental Protection Agency Contract, APRAC Proj. CAPE-13-68, Rept. EPA-460/3-74-010-g, 398p., July 1973.*

NTIS: PB 225161/9AS

Programmer/user operating instructions and input formats are described for the General Economic Effectiveness Program (GEEP), a computer model which simulates the dynamic behavior of alternative vehicle inspection/maintenance systems. The program is general in design and can be used to assess a wide range of inspection/maintenance strategies for reducing vehicle exhaust pollution. The mathematical framework used in developing the basic model is described along with an overview of the programs structure. Input requirements and formats for undertaking a computer simulation run are outlined, and tables of the available input and output options are included. Detailed information on the deck setup, computer resource requirements, and program debugging options are given along with a complete set of flow schematics and listings for each of the 55 subroutines contained in the program.

45682 **APTIC NO. 68411**

Scott Research Labs., Inc., San Bernardino, Calif.

A STUDY OF MANDATORY ENGINE MAINTENANCE FOR REDUCING VEHICLE EXHAUST EMISSIONS. VOLUME VIII. EXPERIMENTAL CHARACTERIZATION OF VEHICLE EMISSIONS AND MAINTENANCE STATES (FINAL REPORT). *Coordinating Research Council, Inc. and Environmental Protection Agency Contract, APRAC Proj. CAPE-13-68, Rept. EPA-460/3-74-010-h, 200p., July 1973. 8 refs.*

NTIS: PB 225026/4AS

Data from an experimental program involving the characterization of vehicle emissions and maintenance states are presented as part of an effort to develop input data for a computerized system model of the effect of mandatory engine maintenance on reducing vehicle exhaust emissions. Topics covered include: the experimental characterization of vehicle emissions and tune-up parameter deterioration, the effect of repeated testing, and the effect of cold soak temperature on exhaust emissions. Statistically significant deterioration rates were consistently obtained for only the Cold 1972 Federal Emissions and Air Cleaner Restrictions. Analysis of data taken in the cold soak temperature experiment indicated significant dependency (greater than 99%) of carbon monoxide emissions with soak temperature for vehicles representative of all three vehicle fleets tested in the parameter deterioration experiment. A comparable highly significant dependency (98%) of hydrocarbon emissions with emission controlled vehicles and nitrogen oxide controlled vehicles was also noted. Dependency of NOx emissions was observed only with emission controlled vehicles.

45683 **APTIC NO. 68505**

National Academy of Engineering, Ad Hoc Panel on
Evaluation of Coal-Gasification Technology

EVALUATION OF COAL-GASIFICATION TECHNOLOGY. PART 1. PIPELINE- QUALITY GAS (FINAL REPORT). *Office of Coal Research Contract 14-32-0001-1216, Research and Development Rept. 74, Interim Rept. 1, 90p., 1973 (?). 27 refs.*

NTIS: PB 234036; GPO

An evaluation of various coal gasification processes is presented, with particular reference to the production of pipeline quality gas. The Lurgi gasifier is at present the only coal- gasification process ready for commercial application. Two plants of 250 million cf/day are being considered for construction in the Southwest with private funding. The support of research on several new processes is recommended until such time as experience with large pilot plants establishes clearly identifiable advantages on one sequence of process steps over the others. The estimated capital investment required for 12 coal-gasification plants that would produce one trillion cubic feet of gas per year (about 5% of 1970 production and 5% of the estimated 1990 deficiency) is about $3.4 billion. Development problems in coal gasification include: requirements for specific data on the effect of hydrogen pressure, temperature, time, and catalysts: the development of a simple, continuous method for feeding coal into a pressurized system; and the development of proper safeguards for very large installations making pipeline gas which are likely to create pollution problems.

45684 **APTIC NO. 68610**

National Academy of Sciences-National Academy of Engineering National Materials Advisory Board, Washington, D. C., Committee on Technical Aspects of Critical and Strategic Materials

A SEMI-DELPHI EXERCISE ON SUBSTITUTE CATALYSTS FOR PLATINUM IN AUTOMOBILE EMISSION CONTROL DEVICES AND PETROLEUM REFINING (FINAL REPORT). *General Services Administration Contract GS-OO-DS-(P)- 94008, Rept. NMAB-314, 53p., March 1974.*

NTIS: PB 232985

The format of summarizing the responses to an iteration of pertinent questions, followed by a workshop, appears to be an effective method for collecting information when little information is available or crystallized. This type of Delphi exercise was used to conduct a study of base metal catalysts for automobile emission control devices. The state of the art on base metal catalysts for automobile emission control devices and petroleum refining is presented. Possible scenarios, affer the introduction of the first generation of emission control devices containing platinum, are presented along with suggested areas for research in base metal and platinum catalysts. Factors that could affect the requirements for automobile exhaust catalysts are also described. The questionnaire and research methods used in the studies are described. (Author abstract modified)

45685 **APTIC NO. 68925**

National Academy of Sciences, Washington, D. C., Committee on Motor Vehicle Emissions

AN EVALUATION OF ALTERNATIVE POWER SOURCES FOR LOW-EMISSION AUTOMOBILES, NATIONAL ACADEMY OF SCIENCES. *Office of Air and Water Programs Contract 68-01-0402, 155p., April 1973. 161 refs.*

NTIS: PB-224 839

Alternate power systems were evaluated for low emission automobiles. They include: diesel, gas turbine, Rankine cycle, and Stirling engines; electric vehicles; and alternative fuels. Various aspects of each engine-system were considered including emissions, fuel economy, noise, cost size and weight, produceability and driveability. The relative status of the various alternative engines is tabulated. The various forms of alternative engines in present and advanced states of development are compared with the precontrol gasoline engine. Present production status, the earliest probable date for limited production, and the earliest possible data for mass production are indicated. (Author abstract modified)

1972

45686 **APTIC NO. 68623**

Atsukawa, Masumi, Kazumi Kamei, Kikushi Tsuneyoshi, and Toshihiko Furumoto

WASHING OF GASES. *(Verfahren zum cyklischen Gegenstromwaschen von schwefeloxidhaltigen Verbrennungsabgasen). Text in German. (Mitsubishi Jukogyo K.K., Tokyo (Japan)) W. Ger. Pat. Appl. 2,161,475. 5p., July 13, 1972. 3 refs. (1 claim).*

Cyclic countercurrent washing of waste combustion gases containing sulfur oxides is effected using lime suspension. A pH 3value less than 4 is held in a first absorption unit and a pH value less than 7 is held in a second unit and, on reaching a pre-given pressure loss, the current directions of gas and absorption liquid are reversed.

45687 **APTIC NO. 68806**

Averbukh, V. Y., Y. D. Averbukh, and V. A. Kuz min

THE STUDY OF THE STAGED REMOVAL OF FINELY DISPERSED DUST CONTAINING FREE SIO2 FROM AIR USING VENTURI SCRUBBERS. *Tr. Ural ak. Politekhn. Inst., no. 205:101-105, 1972. 2 refs. Translated from Russian by Ray E. Zarza, Air Force Systems Command, Wright Patterson Air Force Base, Ohio, Foreign Technology Div., FTD-HT-23-1316-74, 9p., June 17, 1974.*

NTIS, DDC: AD 781148

Removal of silica dust particles of less than 10 micron in size is effective in venturi scrubbers. However, a device of this type demands large expenditures of electric power. An investigation was therefore conducted of staged dust trapping in venturi tubes to determine if smaller expenditures of electric power would occur. With an increase in the air flow rate in the throat at a constant specific spraying capacity and with an increase in the specific spraying capacity at a constant air flow, the effectiveness of trapping increased. However, the hydraulic resistance also increased. A gas flow rate in the throat of 25 m/sec and a total specific spraying capacity of 6 l/cu m of the air were the optimum conditions. At these parameters, the hydraulic resistance of the two venturi tubes was 100 mm water, and the effectiveness of trapping was 96-97%. Under these conditions, particles with a diameter of less than 1 micron were not trapped, but particles 2-5 micron in diameter and larger were practically all trapped. During staged cleaning, the degree of trapping was 3-4% high and the hydraulic resistance 20-40% lower than during cleaning using one venturi tube. Staged cleaning is advantageous based on efficiency and on energy expenditure.

45688 **APTIC NO. 68774**

Bishop, John W., Ralph Ederer, Shelton Earlich, John S. Gordon, and F. W. Reinhardt

THE CURRENT STATUS OF FLUIDIZED-BED BOILER DEVELOPMENT. *Preprint, Mid-West Coal Producers Inst., Inc., National Coal Assoc., Washington, D. C., National Assoc. of Power Engineers, Chicago, Ill., Indiana State Assoc., NAPE, and Purdue Univ., Lafayette, Ind., 41p., 1972 (?). (Presented at the Industrial Coal Conference, Oct. 4-5, 1972.)*

The current status of fluidized-bed boiler development is reviewed. The basic justification of the development of such boilers is their ability to burn high sulfur coal with low sulfur dioxide and nitrogen oxide emissions and to utilize the fluid bed s inherently high heat release and heat transfer coefficients which drastically reduce the size, weight, and cost thereof. Heat releases of 300,000 to 400,000 Btu/cu ft and transfer coefficients from 50-60 Btu/sq ft/hr/degree F are possible in high velocity (atmospheric combustion pressure) experimental units and in one low velocity pressurized column. Fluidized-bed boilers can be built into the 300,000 lb/hr range as factory-assembled, packaged units. In conjunction with the basic coal-fired, fluidized-bed boiler, a system for recovering unburned carbon exists wherein the fly ash is passed once through a high temperature fluidized-bed zone for demonstrated overall combustion efficiencies of 99%. Where sulfur dioxide abatement is required, fine pulverized limestone is passed through the inert ash bed; alternatively, the bed itself may be composed of coarse limestone. Currently, only the calcium components in the limestone are capable of retaining sulfur (at the encountered bed temperatures), although the magnesium compounds (in dolomite) seem to provide a favorable catalytic effect.

45689 **APTIC NO. 68[illegible]90**

Clayton, P., D. J. Ellis, P. L. Palmer, C. J. Potter, and S. C. Wallin

THE EVALUATION OF A FILTER FOR THE REMOVAL OF LEAD FROM THE EXHAUSTS OF PETROL ENGINES. *Dept. of Trade and Industry, Stevenage (Great Britain), Warren Spring Lab., WSL LR 170 (AP), 76p., Jan. 1972.*

Engine and chassis dynamometer studies and road tests were conducted on a filter for the removal of particulate lead from engine exhaust. The filter consisted of stainless steel wool coated with alumina; it was designed to replace the ordinary muffler. Engine dynamometer tests showed that 39.1% of the lead input was emitted from the filter-fitted exhaust system as compared to 57.1% for a conventional exhaust system. The filter eventually became inefficient, probably due to the breaking of the physical bond between the alumina and stainless steel substrate. Chassis dynamometer and road tests for a combined total distance of 27,000 km indicated satisfactory performance of the filter which emitted 46% less lead than standard systems. (Author summary modified)

45690 **APTIC NO. 69131**

Connor, J. M., G. J. Dell, and D. J. Newman

POLLUTION CONTROL IN ACID PLANTS. *Chem. Age India, 23(2):103-117, 1972. (Presented at the UNIDO 2nd International Fertilizer Symposium, Viev, USSR and New Delhi, India, 1971.)*

Pollution problems and emission control measures are reviewed for plants involved in the production of sulfuric acid, phosphoric acid, and nitric acid. Incomplete conversion of sulfur dioxide to the trioxide is the fundamental difficulty encountered in H2SO4 plants. The double absorption process appears to be the most successful on a commercial scale for minimizing sulfur dioxide emissions. Fluorides released during rock digestion and acid concentration are the main problems of phosphoric acid production. These emissions can be minimized by use of properly designed scrubbers and by product recovery techniques. Nitric acid plants discharge unabsorbed nitrogen oxides in the absence of control measures. These can be most economically eliminated by reaction with fuel in a catalytic combustor. Adsorption of NOx on silica gel or on molecular sieves is also feasible, though not economically competitive at present with catalytic combustion.

45691 **APTIC NO. 68572**

Dwyer, F. G. and C. R. Morgan

THE KINETICS OF PROPYLENE AND CARBON MONOXIDE OXIDATION OVER SUPPORTED COPPER CHROMITE CATALYST--EFFECTS OF DIFFUSION AND LEAD DEACTIVATION. *Am. Chem. Soc., Div. Petrol Chem., Preprints, 17(4):H9-H23, 1972. 4 refs.*

The physical and chemical parameters of a supported copper chromite catalysts for use in automobile exhaust were studied. Two types of catalysts were studied: a spherical catalyst in which the copper chromite is distributed in a shell around the outer portion of the particle; and an extruded catalyst with the copper chromite distributed uniformly throughout the particle. Models were used to study the apparent kinetics in terms of the intrinsic kinetics and the physical parameters of the catalyst. With this basis, the apparent kinetics of the catalysts after aging in leaded fuel were analyzed to determine the apparent mechanism associated with lead deactivation. The analysis of the deactivation of auto exhaust catalysts in leaded fuel exhaust could be adequately explained by the relatively uncomplicated pore mouth poisoning model. The success of the model in explaining the experimental data can lead to the design of catalysts suited to the lead level of the fuel. It would be expected that a similar approach using relatively uncomplicated models would be effective in analyzing sulfur and/or phosphorus poisoning of auto exhaust catalysts and in assisting in preparing catalysts with maximum resistance. (Author conclusions modified)

45692 **APTIC NO. 68764**

Dyck, A. W. J.

NOVA SCOTIA FOREST INDUSTRIES LTD. EXPANDS PULP MILL FACILITIES -- ADDS NEWSPRINT MILL. *Am. Paper Ind., 54(1):25-31, Jan. 1972.*

The expanded pulp mill facilities at the Nova Scotia Forest Industries Ltd. plant are described. The expansion gives more realistic pulping capacities (from 350 tpd to 500 tpd) and includes a newsprint mill. The company is a subsidiary of one of Scandinavia s largest enterprises, Stora Kopparberg AB. Means of pulpwood procurement and the Storafite Process are reviewed. The Storafite process produces a fast-beating pulp (due largely to the retention of the hemicelluloses) and increases yield of bleached pulp. The process uses a conventional chemical recovery system for the recovery of sodium salts, reaction of sodium sulfide with carbon dioxide and sodium bisulfite in a reaction tower to produce hydrogen sulfide and sodium sulfite, a Claus reactor to produce sulfur from H2S, a system for burning the sulfur to produce sulfur dioxide, and a process to liquefy SO2 by compression. A scrubber collects any dust not precipitated by the electrostatic precipitator and recovers any excess SO2.

45693 **APTIC NO. 68376**

Elkin, H. F. and R. A. Constable

CONTROL OF AIR POLLUTION IN PETROLEUM REFINERIES. *Preprint, American Inst. of Chemical Engineers, 45p., 1972. 20 refs. (Presented at the American Institute of Chemical Engineers, Air Technical Forum, Dallas, Tex., Feb. 21, 1972.)*

The control of air pollution in petroleum refineries is reviewed in relation to refinery technology, source and control of emissions, future requirements under the Environmental Protection Agency guidelines, equipment guarantees, operational problems, downtime, and the problem of determining what is the latest available technology. Potential emissions from refineries include: sulfur oxides, hydrocarbons, nitrogen oxides, particulate matter, aldehydes, ammonia, odors, and carbon monoxide. Atmospheric emissions of sulfur dioxide can be limited by removal of hydrogen sulfide from refinery fuel gas streams, maximizing the use of natural gas as a fuel, blending the heavier high-sulfur internal fuels with desulfurized distillates, and maintaining a high efficiency sulfur recovery plant. Particulate control methods include: scrubbing, incineration, flaring, vapor recovery, and sulfur recovery. Hydrocarbon vapor loss from storage tanks can be minimized by proper tank design, while hydrocarbons produced for gas-recovery can be flared when excessive amounts are vented. Carbon monoxide and hydrocarbons formed during catalyst regeneration can be incinerated. Odors can be minimized by stripping with air, flue gas, or steam and by incineration. Hydrogen treatment can also be used for their destruction or conversion to more desirable products. Electrostatic preipitators and cyclones are effective for particle removal. Carbon monoxide waste-heat boilers afford a means of utilizing the heat of combustion of CO, while eliminating CO emissions. Combustion modifications can control to some extent NOx emissions, and flue gas recirculation also appears to have potential for controlling NOx emissions from process furnaces.

45694 **APTIC NO. 68643**

Erwin, Jimmy R., Edward Ray Lockhart, and Robert Lee Justice

STREAM-WATER SCRUBBER FOR EXHAUST STACKS. *(Vorrichtung zur Nassreinigung von Reaktions- und Verbrennungsgasen). Text in German. (Air Pollution Research and Developing Corp., Ashland, Ky.) W. Ger. Pat. Appl. 2,129,974. 4p., Feb. 24, 1972. 3 refs. (3 claims).*

A wet scrubber for reaction and combustion gases in an exhaust gas chimney has an enlarged cross section relative to the chimney and contains conical, superposed baffle plates spaced from the inner walls and with their vertices upward. An annular spray forms a water curtain above the upper-most baffle, on whose lower edge is an annular steam-blower directed countercurrent to the exhaust gas. Preferably there are 2 baffle plates, with the same periphery. The blower s diameter exceeds that of the spray.

45695 **APTIC NO. 68633**

Isahaya, Fumio and Tugihiro Yukitake

PURIFYING EXHAUST GAS. *(Verfahren und Vorrichtung zur Reinigung von Verbrennungsabgasen). Text in German.*

(Hitachi Ltd., Tokyo (Japan)) W. Ger. Pat. Appl. 2,159,186. 5p., June 15, 1972. 1 ref. (2 claims).

Toxic impurities such as sulfur dioxide, nitrogen dioxide, nitric oxide, hydrogen sulfide, hydrogen fluoride, or fluorine are removed from combustion gases in a scrubber or washing tower by sprayed-in reagent solution as a fine cloud according to the temperature of the gases and the concentration of impurities, such that the temperature of the gases leaving the tower is above the dew point, all the liquid in the tower is vaporized and the reaction products of the impurities are obtained at the towers outlet in solid form. The apparatus is described.

45696 **APTIC NO. 68639**

Kelly, Daniel, Walter Curlook, Malcolm Charles Evert Bell

REDUCING OXIDES OF NICKEL AND COBALT. *(Verfahren zur Reduktion von Nickel und Cobaltoxiden). Text in German. (International Nickel Co. of Canada, Ltd., Copper Cliff (Ontario)) W. Ger. Pat. Appl. 2,134,116. 4p., Jan. 27, 1972. 3 refs. (3 claims).*

Nickel or cobalt oxides, or their precursors, are mixed with a carbonaceous reductant (preferably liquid hydrocarbon) and briquetted. The briquettes are formed as a flat bed less than 12 cm high and passed through a furnace chamber at 750-1000 C, in which the heating and reducing atmosphere is achieved by passing burnt fuel into the chamber at a large number of points so that heating and removal of gaseous products from the chamber are both rapid. The method is applicable to (hydr)oxides or carbonate mixtures yielding dust-free agglomerates in which the Ni and Co values are present almost entirely as free metals. The waste gas leaves the process free of dusts.

45697 **APTIC NO. 68796**

Lester, George Ronald

OXIDIZING ENGINE EXHAUST GASES. *(Vorrichtung zur katalytischen Umwandlung der Auspuffgase von Brennkraftmaschinen). Text in German. (Universal Oil Products Co.. Des Plaines, Ill.) W. Ger. Pat. Appl. 2,130,436. 4p., March 30, 1972. 2 refs. (1 claim).*

A combined thermal and catalytic converter of compact design for the destruction of harmful exhaust gas components and especially soot is described. The converter has high efficiency, and is usable in any type of motor vehicle. The converter comprises a combustion chamber forming an inner space surrounded by the catalyst-containing chamber. The fuel supply to the combustion chamber is controlled as a function of the catalyst temperature. The fuel supply is shut off at 399 C, and turned on again at a catalyst temperature of 385 C to achieve quantitative oxidation of soot. Ordinary motor fuel or propane, butane, pentane, hexane, octane, or methanol can be used as auxiliary fuel.

45698 **APTIC NO. 69142**

Meinel, Aden B. and Majorie P. Meinel

A HARVEST OF SOLAR ENERGY. *Preprint, REERIO, Las Cruces, N. Mex., 7p., 1972. (Presented at the REERIO Conference, The Energy Crisis, May 4-5, 1972.)*

A solar power generating system which produces electricity by thermal conversion of sunshine to produce steam is described, and future options to provide energy are reviewed. Energy options requiring major efforts include breeder reactors and fusion power; options requiring minimal efforts include coal gasification, nuclear stimulation, and geothermal power; options requiring zero effort include water power, solar power, sea thermal/saline ponds, wind power, and tidal power. Solar energy options include direct conversion, biological (algae/methane), biological (grain/alcohol), biological (animal/methane), sea thermal gradients, thermocouple, thermal (hydrogen dissociation), and thermal (thermodynamic cycle). The future of solar power is discussed, with emphasis on economics and engineering requirements.

45699 **APTIC NO. 68794**

Opp, Karl, Alfons Janson, Siegfried Schreiner, and Wolfgang Heck

REMOVAL OF CHLORINE AND PHOSGENE. *(Verfahren zur Entfernung von Chlor und/oder Phosgen aus Abgasen). Text in German. (BASF AG, Ludwigshafen (Germany)) W. Ger. Pat. Appl. 2,115,859. 2p., Oct. 12, 1972. (2 claims).*

A method for the removal of chlorine and/or phosgene from waste gases generated during aluminum chloride production by reaction of aluminum oxides with chlorine and/or phosgene in the presence of carbon monoxide is described. Practically quantitative removal of chlorine and phosgene is possible by leading the gas to be purified through a pumice-filled column for the retention of particulates, and a successive aluminum scrap layer in a temperature range of 300-600 C (preferably between 400 and 500 C). Chlorine and phosgene react with aluminum to form aluminum chloride. Aluminum chloride vapor present in the waste gas is condensed in the reactor.

45700 **APTIC NO. 68793**

Pennachetti, John T. and Joseph F. Boux

FLY ASH RECOVERY AND USE. *(Verfahren zum Nutzbarmachen von Flugasche). Text in German. (Enercon International Ltd., Hamilton (Ontario) W. Ger. Pat. 1,812,714. 4p., March 16, 1972. 5 refs. (Appl. Jan. 21, 1971, 2 claims).*

A method for the recovery and utilization of fly ash especially from coal-fired boiler plants and metallurgical operations is described. The dry ash is divided into a magnetic fraction and a non-magnetic fraction by dry magnetic separation and the latter fraction is sifted to obtain a cement-like material, another coarse fraction which is subsequently screened to obtain a coarse carboniferous fraction which can be used for combustion, and another sinterable fraction which is agglomerated and sintered to be used as cement. According to another modification of the recovery method, the fly ash is first separated by sifting into a coarse and a fine fraction, after which the coarse fraction is divided into a coarse carboniferous fraction and an iron concentrate by dry magnetic separation. Also, the carboniferous fraction is screened, and the sinterable fractions are sintered after agglomeration.

45701 **APTIC NO. 68748**

Rossano, August T., Jr. and Hal F. Alsid

EVERGREEN POINT BRIDGE TOLL BOOTH VENTILATION STUDY (FINAL REPORT. *Washington Univ., Seattle, Wash., Water and Air Resources Div., Washington State Highway Commission Contract Y-1432, Rept. 4.1, 37p., Sept. 1972.*

NTIS: PB 221161

Results are reported from a study of the exposures of toll collectors to carbon monoxide at the Evergreen Point Bridge spanning Lake Washington between Seattle and Bellevue. The study consisted of two phases: designing, installing, and operating an automatic continuous CO monitoring system to establish typical air quality patterns in and around toll booths and, secondly, developing a prototype toll booth positive ventilation system in which air is introduced through a vertical diffuser situated at one wall of the booth and travels horizontally across the booth and out the door. Parametric studies of sources and rates of ventilation air, diffuser design, and other toll booth modifications were conducted in the laboratory and subsequently these modifications were installed and investigated at an operating booth at the toll plaza. Concentrations of CO in the collector s breathing zone were reduced to acceptable levels. Methodologies and results of the studies are described, and design recommendations are offered for the control system. (Author abstract modified)

45702 **APTIC NO. 68776**

Sinha, R. K. and P. L. Walker, Jr.

REMOVAL OF SO2 FROM FLUE GASES USING CALCINED ANTHRACITE AT ELEVATED TEMPERATURES. *AIChE Symp. Ser., 68(126):160-167, 1972. 10 refs.*

The interaction of a typical coal fired power plant flue gas with calcined anthracite in a fluidized bed reactor was investigated between 700-900 C. Anthracite reacts with sulfur dioxide in the flue gas at 800 C forming elemental sulfur, a carbon-sulfur surface complex, hydrogen sulfide, and carbonyl sulfide. The amount of H2S formed is greater than the amount of COS for interaction with wet flue gas. Oxygen containing gases in the flue gas react with the anthracite causing surface area development and activation. Complete removal of SO2 is a function a temperature, the residence time of the gases in the bed, and the extent of saturation of the anthracite surface with S complexes. Complete removal of SO2 can theoretically be continued indefinitely by charging fresh anthracite into the reactor bed at a rate at which it is removed from the bed by gasification. The partially reacted anthracite is catalytically active at about 150 C for the oxidation of H2S, formed as a reaction product, to elemental S. The S is deposited on the catalyst and can be recovered by solvent extraction. (Author abstract modified)

45703 **APTIC NO. 68787**

Springer, Helmut

REFUSE BURNING SYSTEM-COMBUSTION SYSTEM WITH AIR PREHEATING HEAT EXCHANGER AND FLUE GAS DUST EXTRACTOR. *(Muellverbrennungsanlage). Text in German. (Impa- Patentverwertungs-Anstalt, Schaan (Liechtenstein)) W. Ger. Pat. Appl. 2,131,777. 4p., Dec. 28, 1972. 6 refs. (2 claims).*

An air preheating cylindrical heat exchanger has double walls and is accommodated within a preheating chamber heated by combustion gases. Heating flue gas flows upwards through the center of the heat exchanger and air between the walls also flows upwards in the space between the cylindrical walls. Preheated air is directed through outlets into the furnace. Flue gases pass through an afterburner into the dust extractor. Some preheated air is also diverted into the afterburner. The dust extractor may also be used as an additional preheater for combustion air which is blown into the heat exchanger. The treated flue gases can be directly released into the atmosphere.

45704 **APTIC NO. 69116**

Wright, James H.

ENVIRONMENT AND NUCLEAR POWER. *Energy Int., 9(6):32-34, June 1972.*

The use of nuclear power is being subjected to a thorough, penetrating, and detailed examination with regard to safety and environmental effects. Nuclear plants discharge low-level radioactive wastes to the environment in concentrations well below the levels considered safe. Nuclear fuel reprocessing provides extensive treatment of gaseous and liquid effluents, removing large fractions of all radioactive isotopes except tritium and the noble gases, krypton and xenon. Currently, these isotopes are released to the environment during reprocessing. The amounts are relatively minute, however it would be wise to reduce concentrations even further. Nuclear plants collectively discharge less heat than fossil fuel plants and will continue to do so until some time in the next century. However, on a size-for-size comparison, nuclear plant discharge raises the temperature of a segment of a river by 2 F compared to 1.6 F for a fossil fuel plant. The waste heat could be put to use in many biological and biochemical processes. The production of electric power in the U. S. accounts for 13% of the air pollutants such as sulfur and nitrogen oxides, particulate matter, unburned fuel, and carbon monoxide. With the development of fuel gas desulfurization, power generation will become the least polluting of all forms of fossil fuel energy used. Nuclear power generation produces no pollutant emissions. Use of electricity in ground transportation and for combustion heat in processes such as steelmaking could further reduce pollution. Thus, increased use of nuclear power coupled with increased use of electricity could significantly reduce air pollution.

45705 **APTIC NO. 63069**

Environmental Protection Agency, Research Triangle Park, N. C., Office of Air Programs

CONVERSION OF MOTOR VEHICLES TO GASEOUS FUEL TO REDUCE AIR POLLUTION (FINAL REPORT). *13p., April 1972. 3 refs.*

An Environmental Protection Agency position paper recommends the conversion of existing vehicles to gaseous motor fuels for fleet-operated vehicles in those metropolitan areas in which logistical and economic considerations are favorable in terms of fuel and conversion equipment and where major air pollution problems are attributable to the use of motor vehicles. Vehicles likely to receive maximum usage prior to being phased out of use are recommended for conversion first. Estimates by the Institute of Gas Technology on the impact of commercial vehicle conversion on total New York City vehicle emissions indicate reductions of 15.2%, 25.4%, and 10.9% for hydrocarbons, carbon monoxide, and nitrogen oxides, respectively.

45706 **APTIC NO. 68406**

Scott Research Labs., Inc., San Bernardino, Calif.

A STUDY OF MANDATORY ENGINE MAINTENANCE FOR REDUCING VEHICLE EXHAUST EMISSIONS. VOLUME III. A DOCUMENTATION HANDBOOK FOR THE ECONOMIC EFFECTIVENESS MODEL (YEAR END REPORT). *Coordinating Research Council, Inc. and Environmental Protection Agency Contract, APRAC Proj. CAPE 13-68, Rept. EPA-460/3-74-010-c, 91p., July 1972. 2 refs.*

NTIS: PB 220728

Documentation is presented for an Economic Effectiveness Model which is designed to serve as a research and development tool for assessing the various implications of a mandatory exhaust emission control program of vehicle inspection and maintenance. The model is capable of both analyzing the regional feasibility of vehicle inspection/maintenance and specifying an optimal system design. Input data for several regional areas covering the gamut of auto related air quality problems are incorporated into the model. The model can additionally be used to analyze the sensitivity of system performance to various model assumptions and basic data inputs, thus serving as a self regulating device for identifying areas requiring further analytical and empirical definition. The model is best used for evaluating the attractiveness of alternative policies and is capable of simulating the behavior of the inspection/maintenance process over time. Topics discussed in the documentation include: program specification, vehicle emission models, an economic analysis model, an operations research model, a statistical model, utility models and analytical methods of solution.

45707 **APTIC NO. 68407**

Scott Research Labs., Inc., San Bernardino, Calif.

A STUDY OF MANDATORY ENGINE MAINTENANCE FOR REDUCING VEHICLE EXHAUST EMISSIONS. VOLUME IV. EXPERIMENTAL CHARACTERIZATION OF VEHICLE EMISSIONS AND MAINTENANCE STATES (YEAR END REPORT). *Coordinating Research Council, Inc. and Environmental Protection Agency Contract, APRAC Proj. CAPE-13-68, Rept. EPA-460/3-74-010-d, 539p., July 1972. 13 refs.*

NTIS: PB 220729

Automobile emissions and maintenance states were experimentally characterized as input for a computerized system model designed to assess the effect of mandatory engine maintenance on reducing vehicle exhaust emissions. Three distinct experimental programs were conducted: a large scale fleet evaluation to determine vehicle engine parameter setting distributions and component deterioration characteristics with time and mileage; statistically designed tests (orthogonal experiments) of 1971 California and pre-emission controlled vehicles to determine the main effects and first order interactions of emission response to engine parameters; and a survey to determine the maintenance condition (staty of tune-up) of vehicle engine tune-up parameters and emission control systems and components of vehicles in the Detroit area. The designs and results of each experiment are discussed in separate sections.

45708 **APTIC NO. 68408**

Scott Research Labs., Inc., San Bernardino, Calif.

A STUDY OF MANDATORY ENGINE MAINTENANCE FOR REDUCING VEHICLE EXHAUST EMISSIONS. VOLUME V. EXPERIMENTAL INVESTIGATION OF SERVICE ORGANIZATION MAINTENANCE PERFORMANCE (YEAR END REPORT). *Coordinating Research Council, Inc. and Environmental Protection Agency Contract, APRAC Proj. CAPE-13-68, Rept. EPA-460/3-74-010-e, 97p., July 1972.*

NTIS: PB 220730

The experimental characterization of service organization maintenance performance with respect to automobile pollution control systems is developed as input data for a computerized system model designed to assess the effect of mandatory engine maintenance on reducing vehicle exhaust emissions. The maintenance effectiveness of independent garages, dealerships, and service stations is marginal at best with regard to most of the engine parameters investigated. The probability of detecting idle carbon monoxide, idle speed, basic timing and choke blade kick angle maladjustments is significantly higher than the effectiveness in setting those parameters to within specification tolerances. Service organization effectiveness in detecting and repairing failed components which can be corrected by parts replacement is variable, with the effectiveness being higher for those components which are familiar to mechanics (positive crankcase valves, spark plugs, air cleaner elements, and ignition wires). Effectiveness is low for new components such as nitrogen oxide controls. Unnecessary repairs can be expected to occur, and the absolute magnitude of the costs incurred is highly speculative on the basis of available data, running from 10-30% of the repair bill. (Author summary modified)

45709 **APTIC NO. 68627**

Northrop Corp., Anaheim, Calif., Electromechanical Div.

TEMPERATURE TESTING AND ANALYSIS OF THE VACUUM ADVANCE DISCONNECT EXHAUST EMISSION CONTROL (FINAL REPORT). *California State Air Resources Board Contract ARB-1086, Proj. ARB-2-280-10, Northrop Rept. 73Y13, ARB-R-1086-72-05, 118p., Dec. 15, 1972. 6 refs.*

NTIS: BP 228840

The temperature changes on vehicles after vacuum spark advance circuits were disconnected was studied. The vaccuum advance disconnect (VAD) technique is a simple exhaust emission control method capable of reducing nitrogen oxide emissions from used cars, but the feasibility of driveability and operational problems needed investigation. Effects of the VAD on engine temperatures were observed in 200 motor vehicles; 100 cars had no other emission control, and 100 had other systems as original equipment. For controlled vehicles, the coolant temperature was usually unchanged, but seven overheated because of the VAD; six uncontrolled cars boiled over because of the VAD. Engine oil temperature usually decreased slightly with VAD; oil temperature in two vehicles with VAD increased excessively. Exhaust temperatures increased 10% with VAD under load, and about 5% with VAD at idle; they were slightly higher for controlled than for uncontrolled cars. Temperatures generally increased as the ambient temperature increased. (Author abstract modified)

45710 **APTIC NO. 68772**

MITRE Corp., McLean, Va.

SYMPOSIUM ON ENERGY, RESOURCES AND THE ENVIRONMENT. THIRD DAY: SESSION ON OPTIONS FOR THE FUTURE AND THEIR RESOURCES, ECONOMIC AND ENVIRONMENTAL EFFECTS (VOLUME III, REVISION I). *MITRE 72-69, 220p., Oct. 1972.*

NTIS: PB 213 039

The environmental effects of man s energy use and future energy options were the topics at a symposium. The United States long-range programs for meeting energy needs center on the liquid metal fast breeder reactor; coal gasification to produce a synthetic natural gas; and the development of sulfur dioxide removal technology from stack gases. Efforts to develop processes yielding elemental sulfur are being considered as are coal pretreatment and advanced combustion processes which remove S before and during combustion. In Japan, to meet the SO2 emission limit of 0.02 ppm, purchases of low S crude oil, liquid natural gas, or naphtha must be increased. Technology for desulfurization of residual oil or exhaust gas must be developed. The burning of fossil fuels results in atmospheric particle loading. The atmospheric carbon dioxide content will increase 25% by the year 2000. There was a decrease in urban atmospheric particles from 1957 to 1966 at about 50 stations, but an increase of particle of 4%/yr at 20 non-urban stations. The effect of particles on the global heat balance is uncertain.

45711 **APTIC NO. 69111**

Gilbarco Inc., Greensboro, N. C.

VAPOR EMISSION CONTROL IN AUTOMOBILE FUELING. *36p., May 1972.*

The development and design of a tight fill nozzle for the control of vapor emissions in automobile fueling are described. Design criteria include: a means of sealing, a means of preventing delivery except during a seal condition, and a means for venting vapors from the tank.. The nozzle is able to control splashback and recover vapors on the majority of cars of 1958-1968 vintage. The nozzle was not marketed because the design was too complex, too difficult to use, and too costly to be commercially successful.

1971

45712 **APTIC NO. 68654**

Baum, Kurt

PROCESS FOR CLEANING AND COOLING THE WASTE GAS FROM AN OXYGEN STEELMAKING PLANT USING SEPARATE LIQUID CIRCUITS. *(Verfahren zur Reinigung und Kuehlung der Abgase aus Oxygenstahlanlagen mit Hilfe von getrennten Fluessigkeitskreislaeufen). Text in German. (Verfahrenstechnik Dr.-Ing. Kurt Baum, Essen (Germany)) W. Ger. Pat. 1,433,657. 3p., Feb. 25, 1971. 4 refs. (Appl. April 17, 1969, 1 claim).*

For cleaning and cooling of waste gases from oxygen converters fresh sea water mixed with lime milk to obtain the necessary pH is injected directly into the gas. The water vapor adsorbed by the gas is removed by condensation in a separate closed sweet-water circuit. The warmed up sweet water is cooled by indirect cooling with salt water. Much of the iron oxide dust of the gas is entrapped in the sea water which is afterwards removed in hydrocyclones, filters, concentrators, and sifters. The sea water is then returned to the sea. The iron oxide dust remaining in the gas after the sea-water cycle is removed in a Pease Anthony venturi scrubber, operated with sweet water.

45713 **APTIC NO. 68739**

Tadocoro, Tomoo

EXHAUST GAS AFTERBURNER. *(Abgasnachverbrennungsvorrichtung fuer Brennkvaftmaschinen). Text in German. (Toyo Kogyo Co. Ltd., Hiroshima (Japan)) W. Ger. Pat. Appl. 2,101,643. 4p., Oct. 7, 1971. 7 refs. (5 claims).*

An internal combustion engine exhaust gas afterburner has an annular space formed between inner and outer housings. The inner housing is sealingly mounted for displacement by a cylindrical part at each end, longitudinally, and inlet connection(s) at 90 degrees, transversely. One of the cylindrical parts is an outlet connection, and the displaceable mounting point of each inlet connection is a bushing, radially displaceable in the outer housing.

45714 **APTIC NO. 68605**

Voloshuk, V. M.

EFFECT OF ADHESION AND CONSTANT EXTERNAL FORCE ON INERTIAL PRECIPITATION OF AEROSOL PARTICLES. *Fiz. Aerodispersnykh Sist., no. 23:28-41, 1971. 11 refs. Translated from Russian by Marilyn Olaechea, Air Force Systems Command Foreign Technology Div., Wright Patterson AFB, Ohio, Translation Div., FTD-HT-23- 889-74, 18p., June 18, 1974.*

In studying the precipitation of aerosol particles from a flow onto an obstacle (collector), it is necessary sometimes to consider the finiteness of their dimensions. The finite size of thy particles results in their adhesion to the surface of the collector. Generally the effect of adhesion is proportional to the ratio of characteristic particle and collector dimensions, thus adhesion must be considered in calculations for the capture coefficient when the ratio of characteristic particle and collector dimension is either very small or rather large, but there are no other reasons for precipitation of the aerosol particles. The effects of adhesion and constant external force on inertial precipitation of aerosol particles are theoretically studied. A simple method of calculating the capture coefficient taking the finite dimensions of the aerosol particles into account is described and discussed.

45715 **APTIC NO. 68395**

ACTIVATED CARBON S CAPACITY TO REMOVE ODORS. *Air Cond., Heat., Refrig. News, 1971:39-41, Sept. 27, 1971.*

A list of odors is given with the activated carbon capacity for adsorbing them. Activated carbon adsorbs virtually all organic vapors and many inorganic compounds. Its capacity to remove odors varies with the gas concentration in the air, the humidity and temperature, and the odor gas velocity through filters. The table should only be used as a general guide.

45716 **APTIC NO. 69165**

Ford Motor Co., Dearborn, Mich.

A COST-EFFECTIVENESS APPRAISAL OF ALTERNATE SYSTEMS FOR NO-LEAD SAFEGUARD AND REFUELING VAPOR CONTAINMENT. *Preprint, 32p., Oct. 28, 1971.*

A study was made to develop methods to ensure that only unleaded fuel is used in cars equipped with emission control systems which would be rapidly deteriorated by leaded fuel and to develop systems for containing gasoline vapors which are emitted during filling operations. Various alternate solutions were studied for relative performance and costs. The concepts for no-lead safeguards studied were based on the use of different size (smaller) gasoline filler nozzle spout and a matching size filler neck in the car, which would require minor changes to both vehicles and filling stations. No-lead safeguards are essential. The total cost of implementing no-lead safeguards should be offset many times (approximately 29 times over a period of 10 years) by the value saved of catalysts which would otherwise have been ruined or made less effective by the use of leaded fuel. Timing is critical to achieve the needed safeguards for 1974 model California and 1975 model nationwide cars. A positive closure restrictor (or other arrangement which keeps leaded fuel intake to an absolute minimum) offers the most cost-effective solution of the safeguard systems considered. Concentrated effort will be required to implement an optimum system. Hydrocarbon vapor emissions during vehicle refueling are estimated at 0.32 g/mi. Three concepts to reduce vapor losses during refueling were studied. Costs and cost effectiveness were also determined for the vapor recovery systems. The cost of preventing HC emissions from refueling vapor losses is about 1/15th the cost of reducing the same amount of emissions by reducing vehicle exhaust emissions from 1972 to 1975 levels. Practical solutions seem technically feasible to control filling station and new vehicle refueling vapor losses, but a practical solution for older cars is not evident. Virtually complete control of station refueling vapor losses and both new and older car refueling vapor emissions is the most cost-effective approach (assuming a practical solution can be found for handling older cars).

1970

45717 **APTIC NO. 68635**

Duessner, Herbert

DUST REMOVAL FROM WASTE GASES IN CEMENT MANUFACTURING PLANT. *(Verfahren zur Entstaubung von Abgasen). Text in German. (Kloeckner-Humboldt-Deutz AG, Cologne (Germany)) W. Ger. Pat. Appl. 1,557,108. 5p., April 30, 1970. 8 refs. (5 claims).*

Dust is removed from the exhaust gases of a cement producing plant comprising a kiln, a raw meal preheater, and an electrostatic separator, The hot gases are cooled and wetted in a wetting shaft before the separator; some of the dust is deposited at the shaft foot. The scrubber water is recirculated, along with the dusts which could not be removed. The solids-containing excess water is sprayed into the preheater, behind the meal discharge point, in the exhaust gas flow direction.

45718 **APTIC NO. 68816**

Sargeant, Herb Gordon

CHLORINATING IRON TITANIUM ORE. *(Verfahren zur Chlorierung von Eisen-Titan-Erzen). Text in German. (E. I. du Pont de Nemours and Co., Wilmington, Del.) W. Ger. Pat. Appl. 1,533,121, 4p., Jan. 2, 1970. (3 claims).*

A method for the chlorination of iron-titanium ore for titanium extraction, and for the recovery of titanium from the flue gases is described. The finely granulated iron-titanium ore, mixed with coke, is exposed to chlorine in a temperature range of 800-1200 C to convert part of the iron and titanium present in the ore into iron and titanium chloride vapor. The reaction gas, containing high amounts of soluble chlorides, titanium and iron chloride, coke dust, chlorine, hydrochloric acid, iron oxides, and carbon oxides, is quenched in a combination spray condenser and cyclone to 60-180 C. The separated solids are subsequently treated by applying high shear forces provided by a liquid solvent, preferably water, in a series of hydrocyclones to separate the soluble chlorides from the insoluble ones which are then partially dried, mixed with fresh ore, and recycled within the chlorination process.

45719 **APTIC NO. 68622**

Sauermann, Werner and Johannes Liel

CLEANING PROCESS FOR DUST FILTERS. *(Verfahren und Vorrichtung zum Abreinigen von Staubfiltern, insbesondere Taschenfiltern). Text in German. (Standard Filterbau Dr. E. Andreas KG, Muenster (Germany)) W. Ger. Pat. Appl. 1,607,759. 3p., July 9, 1970. 1 ref. (5 claims).*

Dust pocket filters are cleaned by shaking or oscillation at 90 degrees to the filter surfaces, and with additional downward impacts, preferably in a preset sequence with the shaking oscillation, less frequently. An off-balance shaker is used, horizontally connected to the carrier, and movable vertically relative to it by a spring.

45720 **APTIC NO. 68761**

Wendel, Guenter and Fritz Enders

EVAPORATION COOLER FOR COOLING HOT GASES. *(Verdampfungskuehler). Text in German. (Metallgesellschaft AG, Frankfurt (Germany)) W. Ger. Pat. Appl. 1,551,890. 5p., May 14, 1970. 18 refs. (1 claim).*

An evaporation cooler for hot gases which are to be cleaned in an electrostatic dry separator has an upper gas inlet, vertical gas flow and a lower lateral gas outlet duct arranged in a conical extrusion below the cylindrical part of the vertical cooler. The gas discharge duct is trough shaped with a lower dust - discharge slot.

45721 **APTIC NO. 68636**

Winsor, John and John Carruthers

DESULPHURISATION AND HYDROGENATION OF AROMATIC HYDROCARBONS. *(Verfahren zur Entschwefelung von aromatische Kohlenwasserstoffe enthaltenden Fraktionen). Text in German. (British Petroleum Co. Ltd., London (England)) W. Ger. Pat. Appl. 1,568,189. 6p., Feb. 5, 1970. 1 ref. (1 claim).*

Fractions containing aromatics and 1 to 50 ppm by weight of sulfur are hydrodesulfurized without hydrogenating the rings. The fraction, as liquid or vapor, passes over a nickel/sepiolite catalyst containing 1 to 50 wt% of Ni. The sulfur is bonded to the Ni at 50 to 290 C at 0 to 140 atm with a space velocity of 0.05 to 10 vol/vol/hr and hydrogen: hydrocarbon mol ratio of 0.01:1 to 0.5:1. The partial pressure of H_2 is chosen at a low value and the formation of hydrogen sulfide is also kept low. This reduces the need to regenerate the catalyst.

1969

45722 **APTIC NO. 68895**

Date, Tasuku, Akira Ishizuya, Shuichi Yamazaki, Toshio Shioya, Tomoki Kikuraku, Norimitsu Kurikara, and Nobuyuki Togashi

CARBURETOR EXHAUST ANTI-POLLUTION ATTACHMENT WITH PNEUMATIC ACTUATOR ENGAGING VIA LINKAGE WITH THROTTLE LEVEL HELD BY SPRING AGAINST ACTUATING LEVER. *(Vorrichtung fuer Verbrennungsmotor zur Verhuetung der Luftverunreinigung). Text in German. (Honda Giken Kogyo Kabushiki Kaisha, Tokyo (Japan)) W. Ger. Pat. Appl. 1,917,401. 42p., Nov. 6, 1069. (11 claims).*

A carburetor exhaust antipollution attachment has a pneumatic actuator preventing the throttle from shutting fully that operates when the vacuum downstream of the latter exceeds a preset figure, and its linkage bears against a level fixed to the throttle butterfly spindle. This lever has a lug, working between two stops on an operating lever turning freely on the spindle, and which is held by springs against one stop against the action of the actuator until the preset vacuum is reached, thus closing the main throttle. An actuating mechanism engages with the operating lever and also operates an electric changeover switch. The distributor has two sets of contact points, and when the present vacuum is reached this switch alters the ignition timing from the advanced to the retarded condition.

45723 **APTIC NO. 68888**

Ito, Shozo

GAS TREATMENT OF RAW MATERIALS UNDER CONSTANT TEMPERATURE. *(Vorrichtung zur Behandlung von Rohmaterial mit einem Behandlungsgas). Text in German. (Mifuji Iron Works Co. Ltd., Tokyo (Japan)) W. Ger. Pat. Appl. 1,924,666. 14p., Dec. 11, 1969. 7 refs. (2 claims).*

A raw material treater using a gas of constant temperature and composition is for thermal cracking of petroleum hydrocarbon distillation of solids with an inert treatment gas, protective oxidation or reduction of solids, activation of carbonized material, or conversion of petroleum, oil, or water gas to a gas of desired composition. A cylindrical mixing chamber produces a fuel/oxygen or fuel/air mixture which undergoes combustion in a combustion chamber to a mixture containing 2 vol% residual O_2. A conditioning chamber with an additional gas infeed is between the combustion chamber and the raw material treating chamber. The process can be used to produce fuel gas of low carbon monoxide content from coal.

45724 **APTIC NO. 68642**

Mitchell, Hartman and Roy Wilkinson Walker

A BASIC CONVERTER FLUE GAS COOLING AND SCRUBBING SYSTEM COMPRISING A VERTICAL SECTION WITH WALL MOUNTED, WATER COOLED INCLINED PLATES. *(Vorrichtung zum Behandeln der Abgase eines metallurgischen Ofens). Text in German. (Koppers Co., Inc., Pittsburgh, Pa.) W. Ger. Pat. Appl. 1,458,893. 5p., Jan. 9, 1969. 2 refs. (6 claims).*

The treatment installation comprises a vertical shaft, the walls of which partly consist of slightly inclined loose plates, the lower edges of which project into the shaft. Horizontal perforated pipes at the top of the shaft supply water through the shaft onto the plates, under the bottom edge of which is provided a gutter. In the gutters the water is distributed and overflows to the plate underneath, this being successively repeated for lower plates. There is also a horizontal ring pipe system fitted with inwards projecting nozzles for applying jets of scrubbing water or solution.

45725 **APTIC NO. 68889**

Zarker, Keith Emerson

CARBON DIOXIDE REMOVAL FROM GASES USING ABSORPTION LIQUID CONTAINING AN ETHANOLAMINE AND A CYCLOTETRAMETHYLENE SULPHONE AND REGENERATING TWO LIQUID PHASES SEPARATELY. *(Verfahren zum Entfernen von Kohlendioxyd aus Gasgemischen). Text in German. (Shell Internationale Research Maatschappij B.V., The Hague (Netherlands)) W. Ger. Pat. Appl. 1,544,122. 4p., July 31, 1969. 1 ref. (4 claims).*

Carbon dioxide is removed from gas and vapor mixtures containing 15-50 vol% CO_2, e.g., acidic natural gases, hydrogen containing synthesis gas, and refinery- or waste gases, by absorption with a liquid containing one or more ethanolamine (I) and one or more cyclotetramethylene sulfone (II). The mol ratio of CO_2:(I) is greater than 1:4. The resulting 2 liquid phases of absorption liquid are separated independentl. At least part of the regenerated phase is recycled to the absorption zone after mixing the regenerated phases. Regeneration of the ethanolamine phase takes place by raising the temperature to 115-130 C under a pressure of 1-2.1 kg/sq cm absolute. Regeneration of the cyclotetramethylene sulfone phase takes place by reducing pressure.

1967

45726 **APTIC NO. 68615**

Friedlander, S. K. and Ralph E. Pasceri

AEROSOL FILTRATION BY FIBROUS FILTERS. *Biochem. Biol. Eng. Sci., vol. 1:49-67, 1967. 27 refs.*

The theory of aerosol filtration is discussed. The performance of fibrous filters with respect to effective fiber efficiency and particle transfer coefficient is reviewed. The effect of the nature of the aerosol particle transfer coefficient, particle rebound, and the effect of the deposited aerosol material on the filtration process are also discussed. Other aspects described include the determination of the particle transfer coefficient, the coefficient of diffusion and Peclet number, diffusion of particles of finite diameter, correlation of experimental data, comparisons with data of other investigators, impaction range, effect of varying fraction solids, and sample calculations. The particle transfer coefficient is proposed for correlating filtration efficiencies. Such a parameter permits a generalized treatment of filtration by porous beds composed of any type of unitary component. The weight of experimental evidence indicates that surface effects resulting from varying the nature of the aerosol material with a given type of porous medium do not have an important effect on filtration efficiency. Convincing evidence has not been given that the efficiency is independent of the nature of porous medium for a given type of aerosol.

1965

45727 **APTIC NO. 68815**

Lauff, Helmut Peter

REMOVAL OF DUST FROM OXYGEN STEEL CONVERTERS WITH SUPPRESSED COMBUSTION. *(Die Entstaubung von Sauerstoffaufblas-Konvertern mit unterdrueckter Verbrennung). Text in German. Stahl Eisen (Duesseldorf), 85(7):391-397, April 1965. 3 refs.*

The removal of dust from flue gases in an oxygen steel converter plant at Peine, West Germany is described. Design improvements of the gas catching hood helped minimize problems due to accretions, scabs, and skulls in the catching hood and chimney. The flue gases leaving the converter are trapped by the catching hood and cooled by means of a wet cooler from 1600-1800 C before being admitted to the coarse separator. The flue gases are then scrubbed in a ring gap scrubber for dust removal. The purified gas is delivered by an induced draft fan to a 56-meter high chimney at the top of which carbon monoxide is burned off in a torch by means of dependable ignition burners. The waste heat is utilized for space heating via heat exchangers. Utilization of the converter gas, scented with mercaptan to prevent accidents due to CO, in a vertical ingot-heating furnace is being studied.

45728 **APTIC NO. 68814**

Remmers, Karl

DUST EXTRACTION FROM CUPOLAS BY MEANS OF VENTURI TUBE SCRUBBERS. *(Kupolofenentstaubung durch Venturirohranlagen). Text in German. Giesserei (Duesseldorf), 52(7):191-193, April 1, 1965. 2 refs.*

The use and efficiency of venturi tube scrubbers in dust removal from cupola flue gases are described. The throat gases from a cold-blast cupola furnace are cooled by water spray and admitted to a venturi scrubber at a speed of 90 m/sec. Water is injected through oblique nozzles, and the dust particles and water droplets are separated in a centrifugal wet separator. For raw gas dust contents of up to 15 g/N cu m, separation efficiencies of up to 98% were measured. Calculated and measured efficiencies were in good agreement. The throat gases exhausted from a hot-blast cupola furnace were saturated with water vapor, and subsequently sent through the venturi scrubber, wet type cyclone, droplet separator, and, after postcombustion, to a recuperator for hot air generation.

1963

45729 **APTIC NO. 68653**

Bruecker, Rainer, Georg Huck, and Georg Koelling

PROCESS FOR CLEANING COKE GASES FOR THE FORMATION OF A CARBON MONOXIDE AND HYDROGEN ENRICHED FUEL GAS. *(Verfahren zur Reinigung von Kohlendestillationsgasen unter Erzeugung eines an Kohlenoxyd und Wasserstoff reichen Brenngases). Text in German. (Bergwerksverband GmbH, Essen (Germany)) W. Ger. Pat. Appl. 1,186,974. 4p., April 3, 1963. (4 claims).*

Coke gases are cleaned at temperatures between 700 and 1300 C in a catalyst in the presence of water vapor. As catalyst the sulfides and/or oxides of the elements of the 6th, 7th, or 8th sub-group of the periodic system, if necessary on a suitable carrier, are used. The remaining acid pollutants and the water vapor are removed from the gas leaving the catalyst by familiar scrubbing or dry cleaning processes.

1954

45730 **APTIC NO. 68741**

Dorn, Herman W.

THE PROBLEMS OF CONTROLLING ODORS IN PROCESSING PROTEIN FOODS. *Ann. N. Y. Acad. Sci., 58(2):27-33, March 1954.*

A number of methods are described which are utilized in controlling odors arising from the liquid and vapor bases of processing protein food products within and neighboring the corporate limits of a well-inhabited community. The following liquid operations provide some degree of satisfactory pretreatment to eliminate odors from effluents: lime or other chemical neutralization followed by filtration; oxidation by use of hydrogen peroxide; use of excess chlorine or chlorine compounds, followed by the addition of sulfur dioxide; neutralization by ion exchange; and treatment with activated carbons followed by an agitation period and filtration. The following vapor operations decrease many of the process kettle odor problems: generous provision of Transite ducts fitted with condensation traps leading to water-wash or spray fitted with baffles and coarse glass fiber; the same type of tower system fitted with an ammonia spray jet for highly acidic vapors; use of odor modifiers or counterodors for localized areas; cylindrical air ozonizers; and various types of activated carbon adsorption towers. Countercurrent treatment of the odor-laden vapors is employed in all of the tower treatments. Some of the legal aspects of odors in industry are mentioned. (Author summary)

45731 **APTIC NO. 68321**

Lawson, Ernest

ODOR MODIFIERS. *Ann. N. Y. Acad. Sci., 58(2):37-39, March 1954.*

The application of essential oils and related material for the control and modification of undesirable odors is reviewed. Odor control methods include elimination of odor by mechanical and physical means, by chemical means, and by odor masking or modification with aromatic materials. In the first method, odor-bearing substances are mechanically eliminated by washing, filtering, or adsorption. Destruction of odors by combustion is only practical under controlled conditions. Chemical treatment, where applicable, can control bacterial decomposition and the resulting odors. Essential oils have been used by perfumers since ancient times. By combining the various aromatic materials and making use of the particlar properties of the individual components, a whole series of odor modifiers can be built with exceptional performance value. A properly formulated aromatic modifier can economically alter the objectionable odor in volatile solvents such as mineral spirits or methyl ethyl ketone. Aromatic odors can also be used to mask animal odors or odors associated with certain types of diseases. Odor control can be carried into public buildings and can be introduced into air conditioning equipment.

1941

45732 **APTIC NO. 68356**

Lepoivre, A.

GASOGENE FUELS. *National School of Internal Combustion Engines, Conf. Mfr. Use Replacement Fuels Lubr., p. 1-15, 1941. (Paper 4.) Translated from French, 15p.*

The composition and properties of gasogene fuels are described. Wood, charcoal, torrefied wood or brown charcoal, mineral fuels, and briquets are used in gasogenes. The ash composition of wood consists of silica, potash, soda, lime, magnesia, and iron oxides. Various compounds are produced in the heating of wood to charcoal including water vapor, carbon dioxide, carbon monoxide, acetic acid, methylene, tars, and hydrocarbons. Sulfur content is frequently an obstacle in the use of mineral fuels, anthracite, poor coals, cokes, and semi-cokes.

45733 **APTIC NO. 68357**

Lepoivre, A.

THE GASOGENES. *National School of Internal Combustion Engines, Conf. Mfr. Use Replacement Fuels Lubr., p. 16-34, 1941. (Paper 5.) Translated from French, 19p.*

The design and purification of a gasogene apparatus are discussed. A gasogene installation consists of a gas generator, a cooler, a purifier, and an air-fuel mixing chamber. In principle, the gas contains no element capable of exerting an action on the metal walls, but ash dust is formed. Because of its abrasive nature, it must be removed before it can enter the engine. In the case of wood gas, the dust is moistened by water and stopped by multiple impacts. In the case of charcoal gas, only the dust is stopped because the gas is dry.

45734 **APTIC NO. 68358**

Lepoivre, A.

ENGINES FED WITH PRODUCER GAS. *National School of Internal Combustion Engines, Conf. Mfr. Use Replacement Fuels Lubr., p. 35-51, 1941. 7 refs. (Paper 6.) Translated from French, 16p.*

The operation and environmental effects of a gasogene apparatus are discussed. A gasogene apparatus can replace the carburetor in a gasoline-fed engine. Toxic gases do not accumulate in the gasogene. There are three classes of gasogenes: wood gasogenes, charcoal gasogenes, and gasogenes burning solid mineral fuels used alone or in mixtures with vegetable fuels. In the first class, 60 mg of dust and tars are contained in the gas per kg of burned fuel. In the second and third classes there are 30 mg of dust and tars.

45735 **APTIC NO. 68360**

Leroy, A.

USE OF ACETYLENE TO FEED INTERNAL COMBUSTION ENGINES. *National School of Internal Combustion Engines, Conf. Mfr. Use Replacement Fuels Lubr., p. 77-119, 1941. 2 refs. (Paper 8.) Translated from French, 43p.*

The production and purification of acetylene and its application in internal combustion engines are discussed. The production of acetylene is directly related to the calcium carbide resources. The relation between carbide and gasoline is established on the basis of 2 kg of carbide/l gasoline. When acetylene is produced in a generator, it is contaminated with water vapor, lime dust, as well as sulturated hydrogen and phosphorated H2 resulting from the attack of water on calcium sulfide and phosphide contained in the carbide. The dust can be filtered in part with coke filled or pumice-filled filters or more completely by felt or porous paper. The use of acetylene with other fuels is discussed including gasoline, alcohol, gasoline-alcohol mixture, benzene, heavy and complex fuels, ammonia, and producer gas.

45736 **APTIC NO. 68359**

Pignot, A.

FUEL--COAL GAS. *National School of Internal Combustion Engines, Conf. Mfr. Use Replacement Fuels Lubr., p. 52-76, 1941. (Paper 7.) Translated from French, 24p.*

The composition and production of coal gas are discussed. Coal gas contains hydrogen, methane, carbon monoxide, hydrocarbons, carbides, and may contain oxygen, nitrogen oxides, and derivatives of hydrocyanic acid. These compounds can form products (peroxides, ozonides, and fatty acids) which appear as gums which reduce pressure, or attack certain metals. Coal gas can be prepared with a high heating power by catalytic methods or by isolating the low heating value constituents of coal gas and using the residual gas consisting primarily of CH4. Methods and equipment for compressing the gas are described.

MEASUREMENT METHODS

1974

45737 **APTIC NO. 68665**

Abe, Tokio and Mitsu Sone

INVESTIGATION OF MEASURING METHOD OF PCB IN GAS PHASE. *(Kiso PCB sokuteiho no kento). Text in Japanese. Miyagi-Ken Kogai Gijutsu Senta Hokoku (Miyagi Prefect. Pollut. Contr. Tech. Center Rep.), no. 2:24-27, Aprii 1974.*

Polychlorobenzene(PCB) contents in the exhausted gas from garbage combustion and in environmental air in Miyagi Prefecture were measured. For the former, the exhaust gas was sucked from the duct directly by a pump and passed through two mist traps which were maintained at 0 and -78 C and through an n-hexane trap at -78 C. It was confirmed by a preliminary experiment that a change of temperature of the n-hexane trap from room temperature to dry ice temperature prevented vaporization of n-hexane and kept the amount of n-hexane constant. The -78 C n-hexane trap could be used for a long time and PCB was trapped quantitatively. The PCB in the three traps was pooled and n-hexane was separated from water by a fractionating funnel and then concentrated by a KD concentrator, purified by fluorigel column, and finally analyzed by gas chromatography quantitatively and qualitatively. The PCB concentration in the exhaust gas from garbage combustion was below 0.01 mg/cu m. Environmental air was sucked by high volume air sampler for 24 hr and dust collected on filter paper was extracted into 100 ml of n-hexane for 4 or 5 hr. This was concentrated by KD concentrator to 5 ml and analyzed by gas chromatography after purification by fluorigel column. The PCB content in the environmental air collected at three different places in Miyagi Prefecture was below 0.7 mg/cu m.

45738 **APTIC NO. 68525**

Adachi, Fumio, Hiroshi Uchida, Osami Mori, and Ryokichi Negishi

ANALYSIS OF AIR SUSPENDED PARTICULATES BY LASER MICRO-PROBE. *(Reza maikuro purobu ni yoru taiki fuyu ryushi no bunseki). Text in Japanese. Preprint, Japan Society for Spectroscopy, 1p., 1974. (Presented at the Japan Society for Spectroscopy, Spring Meeting, May 22-23, 1974, Paper 1.)*

The possibility of analyzing thhe components of suspended particulates by laser microprobe was examined. For sampling of the air, a six-step cascade impactor was used. The air was led at rate of 9 l/min, and samples of each step were collected in a mylar bag. After drying, mylar film was fixed in a vacuum tube and laser microprobe was applied. Approriate particles were selected by microscope and each particle was given one shot. Optimum conditions for analysis were studied by changing supplementary electrode parameters and laser output. Electrode pressure and laser output were stabilized and inductance L, capacitance C, resistance were varied and dusts were analyzed. The slit width was 10 micron. Elements detected were magnesium, calcium, silicon, aluminum copper, manganese, iron, and zinc. The Mg, Si, and Al could be detected almost all the time regardless of electric charge conditions. The Fe and Mn depended very much on the conditions, and important pollutants such as titanium, vanadium, nickel, chromium, and lead could not be detected at all. Optimum analysis conditions for each element were determined.

45739 **APTIC NO. 69048**

Aoki, Fumio

THE INSPECTION AND AUTHORIZATION SYSTEM FOR POLLUTION MEASUREMENT EQUIPMENT. *(Kogai keiryoki no kentei seido ni tsuite). Text in Japanese. Keiryo Kanri Keisoku Keiso (J. Instrum. Control Assoc. Japan), 23(9):27-31, Sept., 1974.*

Seventeen kinds of concentration measurement apparatus of three types, eight electrochemical, eight spectrophotometric, and one gas chromatography, were listed as legal apparatus in the measurement law issued in April, 1973. Manufacturers are obliged to register with government agencies. Standard models of apparatus for sulfur dioxide, carbon monoxide, nitrogen oxide, total hydrocarbon, oxidants, and harmful metals were manufactured by two government-appointed industrial instrument associations. The standard models were classified based on theory, pollutants, concentration ranges, and pollution sources. The inspection standards for a non-dispersive infrared analyzer for SO2 from emitting sources were as follows: indication changes of zero drift and span drift within 2% of the full scale during a period of 24 hours; 90% response within 4 min; stable indication within 10% voltage change or 1 Hz frequency change; stable indication within 5 degree temperature change in the applicable range; stable indication within 5% change of sample flow rate; and error caused by interferences of moisture and other gases with certain concentrations not exceeding 20 ppm of SO2.

45740 **APTIC NO. 68943**

Arbuzova, A. S., A. I. Kutenova, R. G. Prozorova, L. V. Ovsyannikova, and R. Y. Finkelshteyn

THE SORPTION PROPERTIES OF DIFFERENT AIR DUCTS FOR AIR POLLUTANTS. *(Sorptsionnyye svoystva razlichnykh vozdukhovodov k zagryaznitelyam atmosfernogo vozdukha). Text in Russian. Gigiena i Sanit., no. 7:86-88, 1974.*

The adsorption of ammonia and nitrogen oxides by materials used for gas sampling for concentration measurement, such as stainless steel, glass, and rubber was studied. Sampling was done by the suction method at a flow rate of 0.1 m/sec for nitrogen oxides, and 1 m/sec for ammonia, through tubes of equal length, made of the above materials. The rate of adsorption was determined by comparison with sampling directly in the absorbent liquid. Tubes made of stainless steel and glass had the highest adsorption capacity for nitrogen oxides. Ammonia was adsorbed least by glass, and most readily by rubber. The findings indicate that gas sampling directly into the absorbent liquid is best for pollutant analysis. When sampling gases for continuous air quality control, both direct and indirect sampling is applicable.

45741 **APTIC NO. 68706**

Arikawa, Yoshiko

ON THE CONDITION OF DETERMINING MINUTE AMOUNTS OF SULFUROUS ION (P-ROSANILINE METHOD). *(Biryo aryusan ion no teiryo joken no kento (para sozu anirin-ho)). Text in Japanese. Nihon Joshi Daigaku Kiyo, Kaseigakubu (J., Home Econ. Dept., Japan Women s Univ.), no. 21:133-137, Sept. 1974. 12 refs.*

Experimental conditions for the determination of minute amounts of sulfurous ion (sulfite) based on the reaction of p-rosaniline with formaldehyde were investigated for solutions of sulfite and sodium tetrachloromecurate (II). Temperature effects on color development were examined for solutions containing 0, 5, 20, and 40 micrograms of sulfur as sulfite at temperatures of 10, 20, 25, and 30 C. The absorbance of the colored reaction mixture was measured at the wavelength of 560 micron every several minutes after the addition of p-rosaniline and formaldehyde to sulfites. Each colored solution displayed a time range during which the maximum absorbance remained almost constant, with the time range depending on both temperature and the concentration of sulfites. The optimum range for the determination of sulfites up to concentrations of 40 micrograms of sulfur at 20 C was 14-25 min after the addition of reagents. Measurement of absorbance within the optimum time ranges observed yielded high accuracy and sensitivity. The same behavior for color development and maximum absorbance was observed for three different kinds of p-rosaniline reagents. Coexisting nitrite ions decreased the absorbance of the colored solution, whereas both thiosulfate and sulfide ions increased the absorbance.

45742 **APTIC NO. 69073**

Baity, F. W., W. A. McClenny, and J. P. Bell

DETECTION OF HYDROCARBONS BY CHEMILUMINESCENCE WITH ACTIVE NITROGEN AT 388 NM. *Am. Chem. Soc., Div. Environ. Chem., Prepr., 14(1):310-312, 1974. 1 ref. (Presented at the American Chemical Society, Division of Environmental Chemistry, National Meeting, 167th, Los Angeles, Calif., April 1-5, 1974, Paper 59.)*

A chemiluminescent method for measuring the hydrocarbon levels in a gas sample weighted according to the intensity of the individual hydrocarbon reactions with active nitrogen at 3.88 nm was studied. The relative responses of several hydrocarbons were measured for concentrations in the range of 10 to 100 ppm at both 388.3 nm and 431.4 nm. Of the compounds tested only acetylene showed a response greater than hoped for air pollution applications. Carbon monoxide was added to samples in concentrations up to 200 ppm, which is a typical value for auto exhaust diluted 10 to 1. No change was noted in the signal level for this amount of CO. The signal with 100 ppm nitric oxide was reduced about 10% below the level without NO. With 100 ppm nitrogen dioxide the observed signal levels were reduced about 70%. This level is much higher than any likely found in ambient air measurements or mobile source monitoring.

45743 **APTIC NO. 69077**

Barton, S. C. and E. N. Turner

AN AUTOMATED INSTRUMENT FOR THE CONTINUOUS MEASUREMENT OF REACTIVE HYDROCARBONS. *Am. Chem. Soc., Div. Environ. Chem., Prepr., 14(1):356-359, 1974. 9 refs. (Presented at the American Chemical Society, Division of Environmental Chemistry, National Meeting, 167th, Los Angeles, Calif., April 1-5, 1974, Paper 66.)*

A method for the specific measurement of reactive hydrocarbons was developed based upon the relative reactivity of different hydrocarbons with ozone. An air sample flows through a small photochemical reactor in which all hydrocarbons react in proportion to their photochemical reactivity to form aldehydes and ketones as major reaction products. Colorimetric determination of the total carbonyl products provides a direct measurement of the total photochemical reactivity of the hydrocarbons in the air. The prototype reactive hydrocarbon monitor was operated continuously for 7 wk in downtown Metropolitan Toronto. The sensitivity of the instrument was adequate for ambient levels, and the reactive hydrocarbons accounted for approximately 2-6% of the total hydrocarbon levels measured by the flame ionization method, using a Beckman Model 400 instrument. The average diurnal variation in reactive hydrocarbon levels showed two distinct maxima corresponding to peak traffic periods.

45744 **APTIC NO. 69097**

Beltzer, Morton

MEASUREMENT OF VEHICLE PARTICULATE EMISSIONS. *Preprint, National Inst. of Health, Research Triangle Park, N. C., National Inst. of Environmental Health Sciences and Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Development, 28p., 1974. 5 refs. (Presented at the Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Durham, N. C., April 16-19, 1974.)*

An automobile exhaust particulate sampling system is described which is capable of frequent and convenient operation, is compatible with constant volume sampling, and collects particulate matter at constant temperature during the 1972 or 1975 Federal Test Procedure. Compatibility is obtained because the particulate sampler requires only a small portion of the diluted exhaust and the major portion of the sample is thus available to the constant volume sampling system for the measurement of gaseous emissions. The system consists of a diluent air preparation system, a flow development tunnel, and exhaust injector system, an isokinetic sampling probe, and a particulate measurement device.

45745 **APTIC NO. 68295**

Berglund, Birgitta

QUANTITATIVE AND QUALITATIVE ANALYSIS OF INDUSTRIAL ODORS WITH HUMAN OBSERVERS. *Ann. N. Y. Acad. Sci., vol. 237: 35-50, Sept. 27, 1974. 24 refs. (Presented at the American Society of Heating, Refrigerating, and Air Conditioning Engineers and Air Pollution Control Association Conference, Odors: Evaluation, Utilization, and Control, Oct. 1-3, 1973.)*

Industrial odors were quantitatively and qualitatively analyzed with human observers and a mathematical model for perceptual odor interaction that is applicable to malodors was developed. For odor mixtures where homogeneous odor percepts are formed, the perceived odor strength of the constituents determines the extent of addition and interaction in the olfactory system. The extent of the interactive effect is assumed to be determined by qualitative characteristics of the odors. The additive process dominates the outcome for two and three odor mixtures, whereas the interactive one dominates the four and five odor mixtures. The perceived intensity of industrial odors is related to concentration by a power function that can be used for transforming values of concentration into perceived odor strength. The same unit of measurement must be used for all odor scales before meaningful comparisons between substances can be made. By inserting the odor strength values of the known odorants into the vector model, the combined odor strength of the known odors in the mixture can be predicted.

45746 **APTIC NO. 69103**

Burch, Darrell E., Ross C. Bean, and Francis J. Gates

NO2 ACTINOMETER FOR FIELD USE. *Philco-Ford Co., Newport Beach, Calif., Aeronutronic Div., Environmental Protection Agency Contract 68-02-0798, ROAP 56AAI, Program Element 1A1003, Rept. EPA-650/4-74-036, U-6074, 55p., Aug. 1974. 6 refs.*

NTIS: BP 237745/AS

A nitrogen dioxide actinometer for field use is described which measures the actinic energy in the lower atmosphere available for the photolytic dissociation of NO2 into nitric oxide and oxygen. This energy results from presence of solar radiant energy in the ultraviolet and short-wavelength visible regions. A spherical test bulb containing a mixture of NO2 and O2 (held in the dark for several minutes) is exposed to solar energy resulting in the formation of NO. The concentration of NO is monitored by gas-cell correlation methods involving the infrared absorption by NO. A shutter periodically shades the test bulb from the sun for a 1-minute period every 2 min such that part of the NO recombines with O2 to form NO2. The cyclic change in the NO concentration is then related to the actinic irradiance. Nitrogen dioxide photolysis plays an important role in the formation of photochemical smog, and information about the amount of actinic energy available in the lower atmosphere is required for the development of mathematical models of the atmospheric processes. (Author abstract modified)

45747 **APTIC NO. 68497**

Campbell, J. L., L. A. McNelles, R. R. Gingerich, B. H. Orr, and A. W. Herman

RAPID ANALYSIS OF METALLIC AIR POLLUTANTS. *Can. Res. Develop., 7(5):30-34, Sept./Oct. 1974. 9 refs.*

A multi-element measurement capability is desirable for measuring metals, since the elements may assist in identifying pollution sources. Atomic absorption spectrophotometry is sensitive but has disadvantages in determining the metallic content of particulates collected in high volume samplers in that its single-element capacity demands use of large amounts of sample material, and wet digestion required prior to analysis is time- consuming and may cause low results. Neutron activation offers a degree of multi-element capability but its sensitivity varies widely and is essentially zero for lead. Energy-dispersive X-ray fluorescence analysis (EDX), although somewhat less sensitive than the traditional wavelength-dispersive mode, offers speed, simplicity, low costs, multi-element capability and ease of adaptation to on-line control and data reduction. The design and use of an automated EDX system which can analyze up to 100 specimens per day for manganese, iron, nickel, copper, zinc, lead, selenium, bromine, or other metals at levels in excess of about 0.2 micrograms/sq cm of filter surface are discussed. The multi-element aspect of this technique permits measurement of ratios such as lead/bromine which assist in locating pollution sources. The technique offers the twin potential of analysis of urban air on a much finer time-scale than the usual periods of many hours, and of analyzing the very very small quantities that result from fractionation according to particle size.

45748 **APTIC NO. 69063**

Charlson, R. J., A. H. Vanderpol, D. S. Covert, A. P. Waggoner, and N. C. Ahlquist

H2SO4/(NH4)2SO4 AEROSOL: OPTICAL DETECTION IN ST. LOUIS REGION. *Am. Chem. Soc., Div. Environ. Chem., Prepr., 14(1):78-83, 1974. 11 refs. (Presented at the American Chemical Society, Division of Environmental Chemistry, National Meeting, 167th, Los Angeles, Calif., April 1-5, 1974, Paper 18.)*

A method for sensing aerosols of sulfuric acid, ammonium hydrogen sulfate (NH4HSO4), and ammonium sulfate and atmospheric data obtained in and near St. Louis are described. A humidograph was used to measure the dependence of light scattering coefficient by the particulate matter, b subscript sp, on relative humidity, RH. This system can be operated with the injection of a few ppm of ammonia into the sample flow causing the reaction of H2SO4 and NH4HSO4 to (NH4)2SO4. The aerosol was totally dominated by sulfate behavior at a rural site in Tyson, and was strongly influenced by sulfate at two urban sites. For about 50% of the runs at Tyson, the substance was not deliquescent until ammonia was added indicating a substantial fraction present as H2SO4 or NH4HSO4. At one urban site, 30-50% (10-20 micrograms/cu m) of the aerosol was (NH4)2SO4. The concentrations of elemental sulfur was 3.1 + or - 0.7 micrograms/cu m which was the highest concentration of any element. This amount of S corresponds to 13 + or - 4 micrograms/cu m as (NH4)2SO4 which compares favorably with the estimate from the humidogram.

45749 **APTIC NO. 68599**

Clark, T. A., R. E. Baumgardner, R. K. Stevens, and K. J. Krost

EVALUATION OF NEW OZONE MONITORING INSTRUMENTS BY MEASURING IN NONURBAN ATMOSPHERES. *Am. Soc. Testing Mater. Spec. Tech. Pub., no. 555:101-111, 1974. 8 refs. (Presented at the Instrumentation for Monitoring Air Quality Symposium, Boulder, Colo., Aug. 14-16, 1973.)*

The response and sampling characteristics of chemiluminescent ozone-ethylene monitors, the ultraviolet ozone photometer, and a solid phase chemiluminescent ozone monitor are compared. Gas phase ozone-ethylene monitors from different manufacturers were used in the study to determine the differences in the response and sampling characteristics of some commercially representative monitors. Comparisons included correlation among instruments, typical response characteristics, and a detailed study of maintenance requirements and calibration stability. Calibration data for the ultraviolet photometric monitor indicated a loss of O3 through the system. The solid phase chemiluminescent monitor gave higher average response values for ambient air measurement which could possibly be related to the effect of humidity on the system. In terms of response time, lower detectable limit, and general sampling characteristics, the three ozone-ethylene monitors agreed closely. Differences in engineering and design between manufacturers of ozone-ethylene monitors caused minor differences in response characteristics. The Dasibi monitor correlated well and tracked the ozone-ethylene monitors during the study. Instrument failures and maintenance requirements were low for all monitors tested. The ultraviolet photometric monitor can be used to measure ambient concentrations of O3 on a continuous basis provided the aforementioned problems are corrected. (Author conclusions modified)

45750 **APTIC NO. 69114**

Constant, Paul C., Jr., Michael C. Sharp, and George W. Scheil

COLLABORATIVE TESTING OF METHODS FOR MEASUREMENTS OF NO2 IN AMBIENT AIR. VOLUME 1 - REPORT OF TESTING. *Midwest Research Inst., Kansas City, Mo., Environmental Protection Agency Contract 68-02-1363, ROAP 26AAF, Program Element 1HA327, Rept. EPA-650/4-74-019-a, 115p., June 1974. 5 refs.*

A collaborative test by 10 organizations was performed on the Tentative Method for the Determination of Nitrogen Dioxide in the Atmosphere (Sodium-Arsenite Procedure) to determine the precision and bias of the colorimetric method. All collaborators sampled simultaneously from the NO2 ambient-air sampling system developed specifically for the collaborative test program. Each collaborator drew six samples simultaneously for each of four 24-hour runs, each with a different average NO2 level (84.1, 113.2, 228.3, and 311.7 micrograms/cu m). Four of the simultaneously drawn samples were from an NO2-spiked section and two were from an unspiked (ambient air) section of the sampling system. Each collaborator was given two standard samples (one NO2 and one blank). Nitrogen dioxide challenge levels were obtained from permeation tubes developed by the National Bureau of Standards. Results from spiked and unspiked lines of NO2 were used to determine true values of the levels of NO2 that comprised the challenges to the collaborators sampling trains; in addition, an analysis of variance for both sets of results was made to determine biases and components of variances. The bias to NO2 determinations was relatively small, approximately 3% and was independent of the NO2 level. The sodium arsenite procedure was adequately written for those knowledgeable of sampling and analysis techniques. Results were obtained that were on the average 6.2 micrograms/cu m too low, plus or minus 16 micrograms/cu m over the range of 50-300 micrograms/cu m.

45751 **APTIC NO. 68338**

Copeland, G. E., A. R. Bandy, E. C. Kindle, R. N. Blais, and G. M. Hilton

REMOTE DETECTION OF AEROSOL POLLUTION BY ERTS. *Preprint, Old Dominion Univ., Norfolk, Va., Dept. of Geophysical Sciences, 8p., 1974 (?).*

Photogrammetric and densitometric examination of ERTS-1 MSS satellite imagery of Eastern Virginia coupled with extensive ground truth air quality and meteorological data indicate that the identification and surveying of fixed particulate emitters (smoke plumes) is feasible. Information generated as ground truth correlation to the ERTS imagery includes much oblique and some aerial photography of selected smoke plumes plus data gathered and analyzed by an air pollution monitoring laboratory, a mobile air pollution and meteorological monitoring van, and an air pollution standards laboratory for the calibration of instruments and analysis of samples from the other two laboratories. Photographic studies of particular smoke plumes are an essential portion of the ground truth program because they yield high resolution information and are subject to a large variety of photometric analyses. The quantitative monitoring of smoke stacks from orbital altitudes over state size regions appears possible when tied to realistic plume models and minimal ground truth. Contrast reductions over urban areas can possibly be utilized to produce isopleths of particulates when supplemented by local measurements. (Author abstract modified)

45752 **APTIC NO. 68758**

Corte, G. L., G. Dowd, and J. L. Monkman

WIDE RANGE CONTINUOUS MERCURY VAPOR MONITOR. *Chem. Instrum., 5(4):221-230, 1973-1974. 8 refs.*

A mercury vapor monitor of the double beam atomic absorption spectrophotometer type is described that is designed to measure airborne mercury vapor on a continuous basis in the range of 400 ng to 20 mg mercury/cu m air. The double beam assembly, in combination with a selective filter, permits the measurement of mercury vapor in the presence of the most commonly encountered organic vapors and dusts. The instrument s limiting factor, at the high range, is the saturation concentration of mercury itself, which is theoretically 20 mg/cu m mercury at 25 C, although such a concentration cannot be reached in practice. The stability of the instrumental zero and the magnitude of the electrical noise are the limiting parameters for lower ranges. Instrument drift is plus or minus 1.5, and 10%, respectively, for 50, 20, and 10 mV full scale (24-hour running time); and the noise level is 0, 1, and 2%, respectively. This enables the instrument to measure as low as 400 ng/cu m of mercury in air. The instrument is applicable to a wide range of measurement activities, ranging from industrial hygiene studies to emission studies carried out in the vicinity of chloralkali plants for example.

45753 **APTIC NO. 68337**

Deepak, Adarsh

A STOKES VELOCITY PHOTOGRAPHIC METHOD FOR MEASURING THE SIZE DISTRIBUTION OF AEROSOLS. *George C. Marshall Space Flight Center, Marshall Space Flight Center, Ala., Aero-Astrodynamics Lab., National Aeronautics and Space Administration Technical Memorandum X-64838, S and E-AERO-AF, 7905, 21p., Feb. 21, 1974. 1 ref.*

NTIS: N74-22344

A Stokes velocity photographic method for measuring the size distribution of aerosols is described. Aerosol particles are allowed to settle in a vertical glass-walled vessel, and their settling velocity is determined by photographing them while the light entering the camera is being chopped at a known rate. The settling velocity of each particle can be determined from the photographs; and by applying the Stokes law, the radius of each particle can be calculated. The aerosol number density and size distribution can be obtained if the volume of the photographed region of the illumination is known. Experiments with alumina particles of given size distributions indicate that the method works accurately for aerosols with diameters of greater than or equal to 2.0 micron. One set of typical experimental data for 3.0 micron Al2O3 particles is presented and shows that the measured size distribution peaks at approximately 3.0 micron. The precise error limits are not established for the method thus far.

45754 **APTIC NO. 68790**

Dieck, Ronald H. and James H. Elwood

THE ASSESSMENT OF EMISSION ANALYSIS ACCURACY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 21p., 1974. 14 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-91.)*

An assessment of emission measurement accuracy is necessary to determine the significance of observations and to determine compliance to emission regulations. The accuracy assessment should include test instrument precision, calibration gas accuracy, and sample error due to the distribution of data resulting from gas concentrations that are spatially nonuniform. It should also consider the propagation of errors in calibration hierarchy, the proper choice of error units, surveys of instrument precision, the evaluation of the significance of various instrument errors, the assessment of the significance of sampling error, and the methods for demonstrating representative samples and improving instrument precision. Emission instrument precision is best expressed as a percent of full scale. The proper units for bias errors are percent of point. Calibration- to-calibration repeatability may be utilized to estimate instrument precision. Instrument precision shows wide variations from day to day. Correcting past data by post-test calibration adjustments will not, in general, improve emission data altered by instrument drift. Sampling error due to the distribution of emission concentrations in space is the single largest source of uncertainty in emission measurements. To ensure complete compliance, the emission control technology is required to reduce the average engine emissions below the regulation limits by an amount equivalent to the sum of the uncertainty in the measurement and the engine to engine variability. (Author abstract modified)

45755 **APTIC NO. 68314**

Dowd, G. and J. L. Monkman

SOME USES FOR FET INPUT OPERATIONAL AMPLIFIERS IN ANALYTICAL INSTRUMENTATION. *Preprint, American Chemical Society, Washington, D. C., 49p., 1974. (Presented at the American Chemical Society National Meeting, 168th, Atlantic City, N. J., Sept. 8-13, 1974, Paper CD-616.)*

A field-effect tranzistor input operational amplifier is described along with seven circuit systems built around the amplifier which are applicable to analytical instruments for air pollution monitoring. The group of circuits consists of a differential voltage sensor, al low-pass filter, a differential current sensor, an integrator, a complementary voltage scanner, a time marker, and a mass spectrometer sector scanner. All of the circuits are built around a single basic operational module which in turn is constructed around an FET input operational amplifier which reflects the current analog electronic state of the art. Practically all the functions of standard pollution monitoring equipment may be handled by any one of the basic operational modules described.

45756 **APTIC NO. 68757**

Dowd, G. and R. S. Thomas

ELECTRONIC DESIGN PARAMETERS FOR OPTIMIZING PHOTOMETRIC MERCURY DETECTORS. *Chem. Instrum., 5(4):231-241, 1973-1974. 3 refs.*

An electronics package for optimizing the input-output electronic circuit parameters of double beam photometric detectors is described which is directly oriented toward the monitoring of airborne mercury. The optimizing package consists of the following: a regulated anode voltage for the two phototubes that is free from switching transients, a filtered alternating current mercury lamp power source, a preferred design for the primary detector bridge, a high quality detector interface, a method for balancing the optical paths for zero outputs, line level monitoring output, and lamp level monitoring output. The effect of a series of single injections of mercury vapor on the differential voltage output are shown and indicate that the sensitivity of thy photometric system is barely tapped (over 10 mv output at 4 ng mercury).

45757 **APTIC NO. 69865**

Dowd, G. F., L. Dubois, and J. L. Monkman

INTEGRATION AND ENHANCEMENT OF LOW LEVEL SIGNALS FROM AIR POLLUTION MONITORING SENSORS. *Am. Chem. Soc., Div. Environ. Chem., Prepr., 14(1):174-179, 1974. 6 refs. (Presented at the American Chemical Society, Division of Environmental Chemistry, National Meeting, 167th, Los Angeles, Calif., April 1-5, 1974, Paper 34.)*

The integration and enhancement of low level signals from air pollution monitoring sensors were demonstrated. Signal enhancement is advantageous in the low level analysis of air pollutants. The type of signal to noise gain which may be expected from an ordinary mercury monitor was shown. As long as an evoked response time constant is introduced into the system, noise of a random nature may be reduced to such an extent that trace signals buried deep in the background may be reliably measured. If this type of measurement is coupled to a multi-parameter Hg analyzer, all contributing factors may be evaluated. The use of wavelength in the enhancement of spectrophotometric signals may be applied to sulfur dioxide analyzing systems employing conductometry. (Author summary modified)

45758 **APTIC NO. 68856**

Durham, J. L., W. E. Wilson, T. G. Ellestad, K. Willeke, and K. T. Whitby

COMPARISON OF VOLUME AND MASS DISTRIBUTIONS FOR DENVER AEROSOLS. *Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center and Minnesota Univ., Minneapolis, Dept. of Mechanical Engineering, EPA Contract 68-02-0333, Grant R800971, 29p., 1974. 17 refs. (Presented at the American Chemical Society, National Meeting, 167th, Los Angeles, Calif., March 31-April 5, 1974.)*

Using data of the Denver 1971 aerosol characterization study, volume concentration distributions calculated from size distribution measurements by the Minnesota Aerosol Analyzing System (MAAS) are compared to mass distribution concentrations measured by eight stage Andersen impactors. A theoretical model shows that cascade impactors with steep efficiency curves should confirm the existence of the biomodal mass concentration distribution measured by the MAAS. With a real cascade impactor, maxima will be depressed and minima filled in to a degree depending on the number of the stages and the steepness of the efficiency curves. The upper mode was confirmed by the impactor measurements, the lower mode was not confirmed probably due to poor resolution resulting from impaction onto the glass fiber filters used as impaction surfaces. The total mass in the lower impactor mode was in agreement with the mass inferred from the volume of the lower MAAS mode. Densities of about 1.7 g/cu cm are inferred for background aerosols and 1.1 to 1.5 g/cu cm for pollution aerosol in the submicron range.

45759 **APTIC NO. 68896**

Dzubay, T. G. and R. K. Stevens

AMBIENT AIR ANALYSIS WITH DICHOTOMOUS SAMPLER AND X-RAY FLUORESCENCE SPECTROMETER. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Chemistry and Physics Lab., 27p., May 1974. 17 refs.*

Aerosol samples were collected in St. Louis using a two stage sampler operating on the principle of virtual impaction. The samples were analyzed for a wide variety of elements by X-ray fluorescence. There was a striking difference between the particles collected in the 0 to 2 micron range and the particles collected in the 2-10 micron range. Although nearly equal mass was collected in the two size ranges, the deposit of small particles was black and the deposit of the coarse particles was a light tan. At least 75% of the sulfur, zinc, bromine, and lead occurred in particles smaller than 2 micron, and at least 75% of the silicon, calcium, titanium, and iron occurred in particles larger than 2 micron. (Author abstract modified)

45760 **APTIC NO. 69128**

Ellis, E. Carol and John H. Margeson

EVALUATION OF TRIETHANOLAMINE PROCEDURE FOR DETERMINATION OF NITROGEN DIOXIDE IN AMBIENT AIR. *Environmental Protection Agency, Research Triangle Park, N. C., Quality Assurance and Environmental Monitoring Lab., Task 015, Program Element 1HA327, ROAP 26AAF, Rept. EPA-650/4-74-031, 34p., July 1974. 11 refs.*

NTIS: PB 237 348/AS

The triethanolamine procedure for determination of nitrogen dioxide in ambient air is evaluated. The method involves sampling for 24 hrs with a fritted bubbler immersed in 0.1 N TEA collecting solution. The range of the method is approximately 20-700 micrograms/cu m. The main points evaluated are: the constancy of the method s collection efficiency, the addition of n-butanol to enhance the collection efficiency, and the need to use fritted bubblers as gas dispersers to assure high collection efficiency. A constant collection efficiency is observed over the method s range both with and without any added n-butanol using either frits or restricted-orifice bubblers; however, the collection efficiency using frits is about 80%, while the efficiency using restricted-orifice bubblers drops to about 50%. Further work on the method does not seem warranted because of the availability of other methods which show more promise for the measurement of NO2 in ambient air. (Author abstract modified)

45761 **APTIC NO. 68460**

Frei, R. W., K. Beall, and R. M. Cassidy

DETERMINATION OF AROMATIC NITROGEN HETEROCYCLES IN AIR SAMPLES BY HIGH-SPEED LIQUID CHROMATOGRAPHY. *Mikrochim. Acta, 1974(5):859-869, 1974. 8 refs.*

The potential of a silver impregnated adsorbent for the analysis of aromatic nitrogen heterocycles by high-speed liquid chromatography has been studied. With a UV monitor (254 nm) linear calibration curves were obtained and detection limits were 0.2-25 ng per injection (1 m column) for the compounds studied. A number of environmental residue samples and high- volume air filters were analyzed for possible interferences and/or the occurrence of any aromatic nitrogen heterocycles. The analysis of spiked air filter extracts gave results that were within 1-10% of known values. The future potential of the silver column and metal impregnated columns in general is discussed.

45762 **APTIC NO. 68704**

Fuhrmann, H.

METHODS FOR MEASUREMENT OF TRACE QUANTITIES OF GASES IN EMISSION AND IMMISSION MONITORING, USING AUTOMATIC ANALYZERS. *(Methoden der Gasspurenmessung im Emissions- und Immissionsbereich mit automatischen Analysatoren). Text in German. GIT (Glas Instrum Tech) Fachz. Lab., 18(9):885-886, 889-890, Sept. 1974. 4 refs.*

Automatic analyzers available for the monitoring of air pollutant emissions and for the determination of trace quantities of such compounds in the air are described, and their principles of operation are outlined. The modern non-dispersive infrared analyzers are suitable for the recording of carbon monoxide carbon dioxide, sulfur dioxide, nitric oxide, and hydrocarbon concentrations in flue gases. Their sensitivity ranges from about zero to several hundred ppm. In a new process developed in the U. S. a common infrared beam is sent through the flue gas duct to be divided subsequently for the separate determination of CO, CO2, SO2, NO, and dust. Dispersive multicomponent photometers are used for the automatic measurement of CO, CO2, SO2, and NO concentrations. Ultraviolet photometric analyzers are suitable for the determination of SO2 and nitrogen dioxide. Sulfur dioxide can also be determined by means of ultraviolet fluorescence analyzers using pulsed ultraviolet energy and a wavelength of 200 nanometers. Photometric analyzers using chemical reactions specific to the components to be analyzed are characterized by very high sensitivity. Such methods are available for the determination of SO2, NO plus NO2, chlorine, ozone, and hydrogen sulfide. The NO and NO2 concentrations in automotive exhaust are determined by chemiluminescence measurement using ozone to oxidize NO to NO2 for the chemiluminescent reaction, and catalyst for the reduction of NO2 to NO. This method is suitable for the determination of NO and NO2 in a concentration range of 0.1-10,000 ppm.

45763 **APTIC NO. 69079**

Gordon, G. E., E. S. Gladney, J. M. Ondov, T. J. Coury, and W. H. Zoller

INTERCOMPARISON OF SEVERAL TYPES OF CASCADE IMPACTORS. *Am. Chem. Soc., Div. Environ. Chem., Prepr., 14(1):367-370, 1974. 9 refs. (Presented at the American Chemical Society, Division of Environmental Chemistry, National Meeting, 167th, Los Angeles, Calif., April 1-5, 1974, Paper 69.)*

Three types of cascade impactors were investigated to determine the seriousness of wall losses and bounce-off. The material collected on the impaction surfaces and filters was analyzed for sodium, aluminum, chlorine, calcium, vanadium, manganese, and bromine. Wall losses were quite small for the Scientific Advances impactor (SA) for V, Mn, Na, and Cl. Most values were above 90%. The Lundgren impactor suffered severe bounce-off problems for particles bearing Al and Ca. There was excellent agreement when two SA impactors were run side by side. For Al and Ca the first two stages of the SA with dry surfaces were typically deficient by 25-40% relative to the SA with sticky collectors. Similar, but less significant bounce-off was observed for Mn-bearing particles.

45764 **APTIC NO. 69060**

Goto, Takeshi

ACCURACY AND MAINTENANCE OF THE SOX METER BY THE NDUV METHOD. *(NDVU ho ni yoru SOx kei no sido iji to maintenance). Text in Japanese. Keiryo Kanri Keisoku Keiso (J. Instrum. Control Assoc., Japan), 23(4):176-178, April 1974.*

Samples gases for the non-dispersive ultraviolet analyzer are collected by means of a sampling probe equipped with a high temperature filter, which is inserted in a chimney. The collected gas is sent to an analyzer through a sampling tube made of teflon. The temperature of the tube is kept above 100 C to prevent the condensation of water, which may dissolve sulfur dioxide resulting in errors. The sample gas is then cooled to room temperature in the analyzer and separated from water. In this case, the dissolution of SO2 in the water is negligible because the contact between water and the sample gas is very small. The sample gas is then heated to a definite temperature above 100 C and introduced into the cell of the the anlayzer at a flow rate of 1.5 l/min. The determination of SO2 in the gas is made with ultraviolet light (280 nm) emitted from a mercury lamp with the aid of a reference light (546 nm). Most of the problems in this continuous analyzer occur in the sampler. Examples of problems are clogging of pipes by some coagulated material and corrosion of sampling parts by sulfuric acid formed by the dissolution of SO2 in water. The sampling system makes use of a sampling probe equipped with a carborundum filter, which is sintered. All of the particles larger than 50 micron in diameter are removed. However dust accumulates in the micropores in the filter and causes problems.

45765 **APTIC NO. 68920**

Hamil, Henry F. and Richard E. Thomas

COLLABORATIVE STUDY OF METHOD FOR THE DETERMINATION OF NITROGEN OXIDE EMISSIONS FROM STATIONARY SOURCES (NITRIC ACID PLANTS). *Southwest Research Inst., San Antonio, Tex., Environmental Protection Agency Contract 68-02-0626, Proj. 01-3462-004, Program Element 1HA327, Rept. EPA-650/4-74-028, 43p., May 8, 1974. 6 refs.*

NTIS: PB 236940/AS

Results obtained from a collaborative test of Method 7 promulgated by the Environmental Protection Agency for determining the nitrogen oxide emissions from stationary sources are presented. Method 7 specifies the collection of a grab sample in an evacuated flask containing a dilute sulfuric acid-hydrogen peroxide absorbing solution and the colorimetric measurement of the nitrogen oxides, except nitrous oxide, using the phenoldisulfonic acid procedure. The test was conducted at a nitric acid plant using four collaborating laboratories. A total of 22 samples were taken over a 3-day period. In addition, standard gas samples were taken, and nitrate solutions whose true concentrations were unknown to the collaborators were prepared for concurrent analysis. The concentrations determined by the collaborators from all three phases of the test were submitted to statistical analysis to obtain estimates of the accuracy and precision of the method. The method was found accurate at the 95% level of confidence. The estimated within- laboratory standard deviation was 14.88% of the mean with 67 degrees of freedom, while the estimated between-laboratory standard deviation was 18.47% of the mean with three degrees of freedom. Laboratory bias standard deviation was 10.49% of the mean. (Author summary modified)

45766 **APTIC NO. 68471**

Hanaoka, Yuzuru

ACCURACY AND MAINTENANCE OF NDIR TYPE NOX METER. *(NDIR-shiki NOx kei no seido iji no tameno kanri to maintenance ni tsuite). Text in Japanese. Keiryo Kanri Keisoku Keiso (J. Instrum. Control Assoc., Japan), 23(5):210-212, May 1974.*

One of the most important measurement variables is the understanding of the properties of the measuring instrument. The conditions of installation such as ambient temperature, humidity, vibration, and the stability of power supply, are very important. Besides these, the method of installation and the conditions of operation are also important. Periodical inspection of the parts, calibration, and replacement of consumable parts are sometimes detrimental to the operation of the instrument. A record of the result of periodic inspection is very helpful in case of troubles. Periodic inspection should be made of the flow rate of the sample gas, zero checking, span checking, the cleanliness of the filter, and the temperature of the nitrogen dioxide-nitric oxide converter. The flow rate usually tends to decrease with time. The causes of this decrease are the clogging of the sample probe, deterioration of the pump, and anomalies in the NO2-NO converter and dehumidifier. For the calibration of the non-dispersive infrared nitrogen oxide meter, the use of standard gas is important. It is necessary to closely check the reliability of the standard gas.

45767 **APTIC NO. 68785**

Hanson, Kirby (ed.), Edwin Flowers, Gary Herbert, Douglas Hoyt, Peter Kuhn, Syukujro Manabe, Rudolf Pueschel, and Lois Stearns

ENVIRONMENTAL RESEARCH LABORATORIES RADIATION PROGRAMS - REQUIREMENTS AND RECOMMENDATIONS. *National Oceanic and Atmospheric Administration, Boulder, Colo., Environmental Research Labs., NOAA-TR-ERL-300-OD-12, 25p., May 1974. 48 refs.*

GPO

The scientific aspects of the Environmental Research Laboratories radiation programs and the requirement for measurement accuracy in these programs are described. Some requirements for accuracies exceed present instrument technology. Requirements for atmospheric turbidity are 0.5% for a pyrheliometer over a period of decades, for regional air pollution are 0.5% over a period of months for a pyranometer, for ocean heat transport are 0.5% over a period of years for a pyranometer, for ocean atmosphere heat exchange are 2% over a period of months for a pyranometer, for atmospheric absorption and scattering are 0.2% over a period of minutes for a pyranometer, and for oceanic attenuance are 2% over a period of months for a pyranometer. At present, the International Pyrheliometric Scale (IPS) is the internationally accepted radiation scale for pyrheliometric measurements. Presently there appears to be a discrepancy of about 1% in the IPS depending on the type of standard used to define it. This discrepancy was determined only recently and is inherent in the definition of the IPS. Several types of absolute pyrheliometers have been produced recently which promise to be useful absolute standards. Recent studies show a discrepancy between National Weather Service and Eppley Laboratory pyranometer standards of 3.5% and in some cases 10.5%. Since present program requirements for accuracy cannot be met by present instrument technology, a central radiation facility should be established to maintain primary standard radiometers with established calibration traceable to the internationally accepted pyrheliometeric scale and to provide facilities for testing and developing detectors, sensors, pyrheliometers, and pyranometers. The need for measurements of atmospheric aerosols and solar energy budget factors is described, and measurement accuracy is discussed. (Author summary modified)

45768 **APTIC NO. 68527**

Hayakawa, Shuji, Hirohisa Shima, Koetsu Matsui, and Yukinobu Yamada

STUDIES ON SUSPENDED PARTICULATES. (NO. 7): HIGH VOLUME C.P.S. SAMPLERS. *(Fuyu funjin ni kansuru kenkyu (dai7ho), hai boryumuyo C.P.S. sanpura ni tsuite). Text in Japanese. Mie-ken Kogai Senta Nenpo (Mie Prefect. Pub. Nuisance Center Annu. Rep.), no. 2:79-81, March 1974.*

Measurements of less than 10 micron particulates and the particle size distribution are difficult because of the limited suction flow quantity of such a sampler. Using a hi-vol sampler and low-vol sampler, the devices CPS and FKS were used for capturing particulates by size and the composition. The weight concentration conversion for less than 10 micron was calculated by the regular logarithm probability. The mean size was 2.3 micron, the ratio of less than 10 micron particles was 74.9%, and the standard error was 10.4. The average weight concentration for less than 10 micron particles was 90 micrograms/cu m (standard error 26) by CPS and 80 micrograms/cu m (standard error 22) with FKS; the correlation was 0.8906. For both devices, almost no variation occurred in suction flow quantities. The use of hi-vol samplers with the CPS device therefore makes sampling of particulates by size possible; but compared to an ordinary hi-vol sampler, the volume sampled is still 1/3 to 1/4, and the quantity of collected pollutant is still less than the desired amount. Further studies will be made using this device on particulate properties, composition, size distributions, and local characteristics.

45769 **APTIC NO. 68851**

Hinkley, E. D. and R. T. Ku

DIODE LASER MULTI-POLLUTANT AMBIENT AIR MONITORING (ANNUAL REPORT). *Massachusetts Inst. of Tech., Lexington, Lincoln Lab., National Science Foundation Grant GI-37603, Environmental Protection Agency Interagency Agreement EPA-LAG-D4-0465, 58p., June 1974. 43 refs.*

Semiconductor diode lasers were constructed and used to study absorption lines of four pollutant gases (carbon monoxide, nitric oxide, ozone, and sulfur dioxide) in the 4- to 6-micron region of the infrared. The high strengths of the CO and NO fundamental bands in this region make it an appropriate one for monitoring at ambient air sensitivity levels. This was not the case for O3 and SO2 whose line strengths in the 4- to 6-micron region were more than an order of magnitude weaker than those at longer wavelengths. Although sufficient sensitivity can be achieved for these two gases in high concentrations near effluent sources, it would be inadequate for ambient air monitoring. The diode laser was incorporated into a closed-cycle cryogenic cooler, which eliminated the need for liquid helium and made possible long-term monitoring outside the laboratory environment. Fundamental spectral parameters were obtained by laser spectroscopy for appropriate lines in the 4.7-micron band of CO and the 5.3-micron band of NO. Samples of raw automobile exhaust and tobacco smoke showed that any of the strong CO lines could be used for monitoring without substantial interference from other atmospheric gases. Field measurements were made to determine the beam cross-section characteristics, intensity fluctuations caused by meteorological conditions, and techniques for overcoming such fluctuations. A derivative/ratio technique was used to measure ambient levels of CO to a sensitivity of a few ppb over a 0.61 km atmospheric path. Finally, a mobile van was purchased, and the diode laser system was incorporated into it for CO measurements to be made at other locations, particularly in St. Louis, Mo. (Author summary)

45770 **APTIC NO. 68480**

Ito, Hiroshi and Akira Nakazawa

ACCURACY AND MAINTENANCE OF SALTZMAN TYPE NOX METER (FOR ENVIRONMENTAL POLLUTION). *(Saltzmann-shiki NOx kei (kankyo-yo) no seido iji no tameno kanri to maintenance ni tsuite). Text in Japanese. Keiryo Kanri Keisoku Keiso (J. Instrum. Control Assoc., Japan), 23(5):216-218, May 1974.*

The title method is being used as a standard method of continuous determination of nitric oxide and nitrogen dioxide in Japan. The collected air passes through a dust filter. Then it enters an NO2 impinger, where the NO2 reacts with a definite amount of the Saltzman solution. After the removal of NO2, the air is oxidized to convert NO to NO2, which is collected in an NO impinger. In this impinger, NO is determined as NO2. The concentrations of NO and NO2 thus determined are recorded separately, and the average concentrations are recorded at the end of each measuring period. The specifications of this instrument are as follows: the range of determination, 0-0.5 and 0-1.0 ppm for NO and NO2; reproducibility, within 2% of the full scale; the measuring period, 1 hr.; rate of flow of atmospheric air, 300 ml/min for 0-0.5 ppm range and 150 ml/min for 0-1.0 ppm range; the volume of the reaction solution, 29 ml; the colorimeter, 1 light source, 2 paths photometric colorimeter; the measuring wavelength, 545 nm; the Saltzman coefficient, 0.72; filter, gas fiber filter paper, 55 in. diameter (GA-20); power source, AC 100 V, 50 and 60 Hz; and output DC 0-1 V linearized. Replacements of parts are necessary for photoelectric tubes, filters, and reagents at various intervals of time. Maintenance points were tabulated.

45771 **APTIC NO. 68448**

Ito, Kuniaki and Tsutae Sebayashi

SPECTROSCOPY OF AIR POLLUTION. *(Taiki osen no bunko-gaku). Text in Japanese. Bunseki Kiki (Analysis Instr.), 12(4):250-262, April 1974. 40 refs.*

The spectroscopic properties of major substances causing photochemical air pollution are discussed. Nitrogen oxides, oxidants, and ozone are analyzed in the ultraviolet region, and sulfur oxides and carbon monoxide in the infrared region. Although there are many reports available on mechanisms of occurrence of photochemical smog, it is still not completely clear. It is not possible to understand the mechanism without sufficient knowledge and understanding of the spectroscopic properties of each substance. In considering electron spectra of nitrogen oxides and hydrocarbons (major reacting substances in photochemical reactions) their molecular structures must be fully understood. Absorption spectra in the visible or the ultraviolet regions are called electron spectra since the transition of electrons in atoms or molecules from one energy level to another level occurs, while in the case of infrared absorption spectra the differences in energy level due to rotation, stretching, and bending vibration of molecules are reflected in the absorption spectra.

45772 **APTIC NO. 68549**

Johnston, James E.

ELECTROSTATIC ENTRAINED MATERIAL MEASUREMENT SYSTEM. *National Aeronautics and Space Administration Case No. MFS-22128-2, Pat. Appl. 450,536, 11p., 1974.*

NTIS: N74-18098

A device for measuring the quantity of particulate matter suspended in air or other gases is described. The apparatus measures the existing electrostatic charge on particulate matter and relates this to particulate matter quantity as opposed to prior art devices which externally generate a charge on the particulate matter prior to measurement. The air or gas sample is drawn at a constant rate with a vacuum pump through a conduit wherein a charging plate is located. An electrostatic charge proportional to the amount of particulate matter in the air is induced on the charging plate by the air flow. The electrostatic field created by the charge on the plate is sensed and displayed on a meter. The system is compact and portable and can be built with the conduit and sensing unit as a mobile probe.

45773 **APTIC NO. 66498**

Kaplan, Hill

PLUMBING PROBLEMS -- GASES FOR 6800 HYDROCARBON ANALYZERS. *Am. Soc. Testing Mater. Spec. Tech. Pub., no. 555:85-87, 1974.*

Some of the problems associated with supplying compressed gases to Beckman 6800 hydrogen flame hydrocarbon analyzers are discussed. Gases under concern include hydrogen fuel, combustion air, calibration gas, and the sample. Criteria discussed are also applicable to other instruments using compressed gas.

45774 **APTIC NO. 68944**

Kellner, K. H. and J. Landbrecht

THE STATE-WIDE AIR QUALITY MONITORING SYSTEM IN BAVARIA. *(Das lugthygienische Landesueberwachungssystem Bayern (LUEB)). Text in German. Gesundh.-Ingr., 95(10):297-301, 1974.*

The air quality monitoring grid which existed in Bavaria was only partially automated. It comprised 27 measuring stations taking emission measurements of sulfur dioxide and partially also of carbon monoxide and the oxides of nitrogen. This measurement grid is now being expanded to a total number of eighty measuring stations and one data processing and evaluating station. In a first expansion phase 14 stations and a computer center will be added for operation in July 1974. The total system shall be completed by 1977. Costs are estimated to reach $5 million. In its final version the system will measure 24 parameters, the pollutants SO2, hydrogen sulfide, CO, nitric oxide, nitrogen dioxide, hydrocarbons, hydrogen chloride, hydrogen fluoride, ozone, the dust concentration and dust fall, meteorological parameters such as wind direction and velocity, air temperature, humidity, pressure, global radiation, precipitation with pH value, noise, radioactivity, electrostatic field, and short- term pressure fluctuations.

45775 **APTIC NO. 69120**

Kesselring, R. C., K. M. Gorji, W. S. Young, W. E. Rodgers, and E. L. Knuth

FLAME CHARACTERIZATION PROBES (FINAL REPORT). *Rockwell International Corp., Canoga Park, Calif., Rocketdyne Div. and Calif. Univ., Los Angeles, Calif., School of Engineering and Applied Science, Environmental Protection Agency Contract 68-02-0628, Program Element 1AB014, ROAP 21ADG-51, Rept. EPA-650/2-74-023, 185p., March 1974. 17 refs.*

NTIS: PB 231169/AS

Experimental methods for use in characterizing the dirty flame (particle-laden) environment resulting from the burning of coal and/or residual oil were sought, with a search of the combustion literature being made to determine the applicability of existing techniques used in the characterization of less formidable flame environments. Techniques selected for measurement of temperature, chemical species (stable and unstable), and velocity (magnitude and direction) in high temperature dirty flames were: pneumatic venturi pyrometer for temperature measurements, the 5-hole pitot probe for velocity measurement, a quick-quench species probe for measurement of stable species, and molecular- beam mass spectrometry for determination of unstable species. Stable chemical species were defined as nitric oxide, molecular hydrogen, molecular oxygen, carbon monoxide, sulfur dioxide, carbon dioxide, molecular nitrogen, nitrogen dioxide, and argon; unstable species were considered as being atomic oxygen, nitrogen, and hydrogen and the hydroxyl radical. Probe designs based on the selected techniques were developed and evaluated in a premixed gas flame, with satisfactory operation being indicated in all cases. Satisfactory agreement was also indicated in comparisons with molecular beam mass spectrometry which was also employed to obtain unstable species concentrations. Evaluation of the probes suitability for use in a residual oil flame was not accomplished within the resources available.

45776 **APTIC NO. 66470**

King, Robert A. and William Hayden Smith

BACKGROUND LIGHT REJECTION IN REMOTE SENSING WITH FABRY-PEROT INTERFEROMETERS. *Princeton Univ., N. J., Observatory, Environmetal Protection Agency Grant R 800805, 13p., 1974 (?). 4 refs.*

The feasibility of using Fabry-Perot interferometers in the remote sensing of gaseous pollutants via their rotational Raman spectra depends upon the rejection of back-scattered light arising from Mie, Rayleigh, and Raman scattering from dust and abundant gases in the region being observed. Measurements of the rejection of Rayleigh and Raman light using Fabry-Perot interferometers in reflection are presented to demonstrate the viability of this method. The rejection of Rayleigh, Mie, and Raman light can be efficiently accomplished, so that detection of impurities in the 200 ppm range is feasible. (Author abstract modified)

45777 **APTIC NO. 69088**

Kipp, K. L. and D. R. Rhodes

A METHOD FOR DETERMINING SULFATES IN AUTOMOBILE EXHAUST. *Preprint, National Inst. of Health, Research Triangle Park, N. C., National Inst. of Environmental Health Sciences and Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Development, 11p., 1974. 3 refs. (Presented at the Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Durham, N. C., April 16-19, 1974.)*

The reported finding of sulfuric acid in automobile exhaust from cars equipped with oxidation catalysts has led to a number of research programs using several sampling and analytical methods. A method was developed for sampling and analyzing auto exhaust for sulfate which is compatible with the constant volume sampler, reasonably quick and simple, and specific for sulfate. The sampling apparatus and the analytical titration method are described. The system was tested on a car equipped with a bead-type platinum catalyst. The sampling and analytical methods combined gave a 77% and 104% collection efficiency of sulfuric acid. Tests to determine if sulfur dioxide would interfere with the analysis showed no significant SO2 interference. In tests of the conversion of sulfur to sulfate, 39% conversion occurred in the 50 mph test and 42% conversion in the 30 mph test.

45778 **APTIC NO. 69064**

Lundgren, Dale A. and Harold J. Paulus

DIRECT DETERMINATION OF THE TOTAL ATMOSPHERIC AEROSOL MASS DISTRIBUTION. *Am. Chem. Soc., Div. Environ. Chem., Prepr., 14(1):88-94, 1974. 5 refs. (Presented at the American Chemical Society, Division of Environmental Chemistry, National Meeting, 167th, Los Angeles, Calif., April 1-5, 1974, Paper 20.)*

The mass distribution of large atmospheric particulate matter was directly determined as a function of particle aerodynamic size. Short term (24-hour) dust fall samples were used as a general measure of the large atmospheric particulate matter at the sampling site. For the test days, dust fall readings ranged from 0.7 to 7.0 g/sq m/mo with an average of 2.9. The Minnesota Ambient Air Quality Standard is 3.5 g/sq m/mo. Several dust fall samples were examined and one, with a dust fall value of 1.6 g/sq m/mo, was carefully counted to determine the resulting size distribution. These dust fall particles were approximately log-normally distributed with a mass median diameter of 55 micron and a geometric standard deviation of about 1.6. Ninety percent of the mass was associated with particles between 25 and 120 micron diameter.

45779 **APTIC NO. 68952**

Masek, Vaclav

PHOTOMETRIC DETERMINATION OF THE TOTAL CONCENTRATION OF PYRIDINE BASES IN THE AIR. *(Photometrische Bestimmung des Gesamtpyridinbasengehalts in der Luft). Text in German. Bitumen, Teere, Asphalte, Peche, 25(9):349-351, 1974. 6 refs.*

By using the photometric method developed by Asmus et al and with the aid of the improved absorption solution by Crecelius and Forweg, the accuracy, stability of solution, and the substance composition in the determination of the total pyridine bases was checked. Absorption in citric acid/butanol mixture proved on the average 39.1% more efficient than absorption in 0.1 N sulfuric acid. It was confirmed that the spectrophotometric method at 578 nm determines pyridine as well as its low molecular homologues (total pyridine bases). The accuracy was highest in the range of 400 to 1600 micrograms pyridine bases in one cu m air. The stability of the pyridine bases in the citric acid/butanol mixture was relatively high. Even after two weeks the analytical results were still within the normal error margin. The method was therefore used for 73 determinations of the total pyridine concentration in air during road pavement work with tar as binding agent. The concentrations ranged on the average from 94 to 2267 micrograms/cu m.

45780 **APTIC NO. 68825**

McNesby, James R.

MEASURES FOR AIR QUALITY (1972-1973). ANNUAL REPORT-FY 1973. *National Bureau of Standards, Washington, D. C., Inst. for Materials Research, NBS-TN-828, 143p., May 1974. 33 refs.*

GPO

Projects in the Measures for Air Quality Program for fiscal years 1972 and 1973 are described. Although air pollution measurement was the major thrust of the program, it has been extended to include the beginnings of a water pollution effort to respond to the Federal Water Pollution Control Act of 1972. The air pollution projects described include: the effect of polymeric structure on the permeation rate of sulfur dioxide; development of equipment and test materials for the evaluation of the reliability of SO2 measurements; fluorescence detection of SO2 in the air at the ppb level; ultraviolet nitric oxide detector; gas standards for air pollution analysis; absolute coulometric determination of NO; nitrogen dioxide permeation tube; infrared laser detector for nitrogen oxides; light scattering methods for determination of the properties of particulate matter in air; instrumentation for particle sizing; fossil fuel standards; X-ray fluorescence analysis of air particulates; airborne quartz measurement; polycyclic aromatic hydrocarbons in airborne particulates; particle dispersion in a gas; urban particulate sample; Project Threshold; analytical reference standards for environmental analysis; characteristics of exponential dilution flasks; calibration standards by thermal decomposition; gas dilution system; automotive exhaust flowrate measurement; survey of various approaches to the chemical analysis of environmentally important materials; electron spectroscopy for gas analysis; laser magnetic resonance spectroscopy; kinetics of atmospheric reactions; atomic reaction kinetics; air pollutant properties; and degradation of polymers.

45781 **APTIC NO. 69066**

McNulty, K. J., J. R. Ehrenfeld, J. B. Homolya, and J. F. McCoy

INVESTIGATION OF EXTRACTIVE SAMPLING INTERFACE PARAMETERS. *Am. Chem. Soc., Div. Environ. Chem., Prepr., 14(1):180-185, 1974. (Presented at the American Chemical Society, Division of Environmental Chemistry, National Meeting, 167th, Los Angeles, Calif., April 1-5, 1974, Paper 35.)*

Extractive sampling interface parameters for the continuous monitoring of nitrogen oxides and sulfur dioxide from Category I sources were investigated. The design of a sampling interface must be predicated on the specific source/analyzer combination for which it is intended. Typical source characteristics were developed for power plants, nitric acid plants, and sulfuric acid plants. Sample temperature and flow rate are not critical parameters, but the proper choice of materials of construction is an important part of the interface design. Some modification of design is required for non-combustion sources. For H2SO4 and HNO3 plants probe-tip filtration is not required. The sample must be transported from stack to analyzer with tolerable losses and interactions. Three types of interaction are detailed: reaction, absorption, and adsorption.

45782 **APTIC NO. 68454**

Mishima, Hideo, Norio Kawahara, and Shozo Yano

THE STATE OF QUALITATIVE AND QUANTITATIVE MEASUREMENT OF AIR-BORNE PARTICULATES. *(Taikichu ryushijo busshitsu no shitsuryo sokutei ni okeru genjo). Text in Japanese. Keiryo Kanri Keisoku Keiso (J. Instrum. Control Assoc. Japan), 23(10):491-498, Oct. 1974. 11 refs.*

Various scales manufactured by the Shimazu Mfg. Co., Japan suitable for weight determinations in air-borne particulate measurements are described. Air-borne particulates are captured by various means: dust tubes, filter papers, high-volume air samplers, impingers, Shimazu Cascade Impactors, Petri dishes, and IKOR Air Quality Monitors. For accurate weight determinations, the sensitivity of the scales must be of the order of 0.1 mg in 200 g. The scales must be of appropriate design to accommodate the sampling device. For example, filter paper should be weighed without folding or crumpling or particles will fall off the paper or become unevenly distributed and cause erroneous weight readings. Dust tubes should be stabilized so that the pan does not tilt. Sketches and photographs of equipment and the suitability of equipment for measuring various forms of particulate matter are included.

45783 **APTIC NO. 68961**

Miyashita, Hidefumi, Jun Kobayashi, Shinzo Kitamura, Yoshishige Murakami, Akira Nishitsugi, Kizuna Suzuki, and Chiyoe Yamanaka

THE ON-LINE LASER RADAR SYSTEM FOR AIR OBSERVATIONS. *(Taiki jokyo kansokuyo onrain reza reda shisutemu). Text in Japanese. Preprint, Japan Society for Instrument and Control Engineers, p. 297-298, 1974. (Presented at the Japan Society Instrument and Control Engineering, Lecture Meeting, 13th, Yokohama, Japan, Aug. 27-29, 1974, Paper 2505.)*

The on-line laser radar system designed for air and air pollution monitoring is discussed. The system utilizes Mie scattering and the back scattering specular light. The laser light produced by the Q switch is transmitted into the air by the irradiation telescope. The back scattering specular light created by aerosols in the air is received by the reception telescope and through the filter, sent to the electron amplifier. The photoelectronically converted signals are changed again into digitals at a 100 n sec cycle, 6 bits, 256 words, and memorized. The data is automatically transmitted to the computer, and the light scattering intensity is computed by the laser radar equation. By hypothesizing the type and distribution of aerosol particles, quantitation of suspended particulates is possible.

45784 **APTIC NO. 69006**

Modowski, E. R.

STACK PARTICULATE SAMPLING. *Mech. Eng., 96(10):29-34, Oct. 1974. 6 refs.*

In-stack particulate emission samplers has been used conveniently and successfully for a number of years, but have not received approval by the Environmental Protection Agency as an acceptable alternate for its own particulate sampling train procedure. Recent comparison tests are described which indicate that the in-stack samplers are more efficient, accurate, and consistent in actual practice than the EPA method. The efficiency of collection of the EPA system was erratic even under controlled conditions. For a series of checks it was below 99% by weight because of lay-down in the long probe ahead of the first filter that is almost impossible to remove completely. A single stage filter of EPA recommended material in an in-stack sampler can be 99% or more efficient by weight without any back-up filter. The EPA system took more than twice as long per test as the less cumbersome in-stack system. Collection in the impinger portion of the EPA train showed an apparently created material that can be volatilized off at higher temperatures. Flue gas moisture content can be established just as accurately by combustion calculations from fuel and gas analyses as by trapping and weighing the moisture in the sampled gas. Isokinetic sampling rates for the EPA system will usually be higher because its S-type pitot tube will indicate a higher velocity head than that obtained by a Fecheimer probe. Laboratory and field test results are presented.

45785 **APTIC NO. 68824**

Neustadter, Harold E., Steven M. Sidik, Robert B. King, J. Stuart Fordyce, and John C. Burr

USE OF WHATMAN-41 FILTERS IN AIR QUALITY SAMPLING NETWORKS (WITH APPLICATIONS TO ELEMENTAL ANALYSIS). *National Aeronautics and*

Space Administration, Cleveland, Ohio, Lewis Research Center, Work Unit 770-18, LRC Rept. E-7576, NASA-TN-D-7595, 62p., May 1974. 26 refs.

NTIS: N-74-22797

A 16-site parallel high volume air sampling network was operated; at each site one unit was operated with glass fiber filters to obtain total suspended particulate measurements and the other unit was operated with Whatman-41 filters to provide particulate samples suitable for elemental and chemical analyses. On the basis of data collected from the parallel network over a 13-month interval and some subsidiary experiments, various aspects of network sampling and filter properties were studied. Sampler-to- sampler and filter-to-filter variability introduced only small errors. The variability of the total suspended particulate measurements appeared to be proportional to their absolute concentrations. The hygroscopic affinity of Whatman-41 filters did not introduce any error, provided there was adequate equilibration and use of control blanks. The total suspended particulate samples collected with glass fiber filters were on the average slightly higher than those collected with Whatman-41 filters. At 10 of the 14 stations there were no statistically significant differences. Of the remaining four stations, there were three where the particulate matter concentration on the glass fiber filters was higher (one much so), while one had higher particulate matter concentration on the Whatman-41 filter. Over the network, there was no statistically significant difference. For environments similar to that of Cleveland, the use of Whatman-41 filters in routine air quality monitoring programs is valid and practicle to obtain samples suitable for elemental and chemical analyses. (Author summary)

45786 **APTIC NO. 68547**

Newton, C. L.

THE DEMA EXHAUST EMISSION MEASUREMENT PROCEDURE FOR LOW AND MEDIUM SPEED INTERNAL COMBUSTION ENGINES. *Preprint, American Society of Mechanical Engineers, New York, 8p., 1974. (Presented at the American Society of Mechanical Engineers, Diesel and Gas Engine Power Conference and Exhibit, Houston, Tex., April 28-May 2, 1974. Paper 74-DGP-9.)*

The Diesel Engine Manufacturers Association (DEMA) is a group of manufacturers of large, low and medium speed, diesel, dual fuel, and spark ignited gaseous fueled internal combustion engines. The DEMA s Exhaust Emission Measurement Procedure is described which was developed to meet the specific needs of the members of the association. The considerations in developing the procedure are set forth and discussed. The instruments which should be used, the measurements which should be taken, and the presentation of data are also discussed. The measurement procedure can be used to measure opacity, particulates, nitrogen oxides, carbon monoxide, total hydrocarbons, methane, oxygen, carbon dioxide, and engine performance data. (Author abstract modified)

45787 **APTIC NO. 69175**

Noda, Ryoichiro

A SIMPLE METHOD FOR THE DETERMINATION OF SO2 IN THE AIR. *(Taikichu no nisanka io no kantan na sokuteiho). Text in Japanese. Kagaku Kyoiku (Chem. Educ.), 22(4):317-321, Aug. 1974. 4 refs.*

Using the simple suction syringe type electroconductivity titration device reported previously, sulfur dioxide in the air was measured. The sample air was passed through dilute hydrogen peroxide solution and by checking the conductivity variation caused by the sulfuric acid created by absorption of SO2 by the absorbent, the level of SO2 was checked. The device was constructed for experiments by high school students and is easy to prepare and simple to operate. The electrode is made of a glass tube with a rubber suction bulb at the end and with two-T-shaped electrodes connected with the tube by silicon rubber stoppers. The distance between the electrodes is about 1-2 cm. There were several problems. When the electric current was close to 50 microA, the reading was extremely inaccurate; but below 10 microA, the indicator was stable and easy to read. When an alternating current air pump was used the SO2 level was much higher than the readings obtained from the direct current or battery current air pumps. With AC current pumps used for over a period of time this type of inaccuracy can occur very often. A glass tube absorption jar can be dissolved to neutralize sulfuric acid, lowering electroconductivity. Much more accurate measurement can be obtained by using a polyethylene absorption jar which is inexpensive, easy to make, and unbreakable. But its lack of transparency and the tendency to form bubbles can be a hindrance. The concentration of sulfuric acid in the absorbent can also cause inaccuracy. The standard liquid should be dilute and SO2 quantity per 0.1 microA should be small for accuracy.

45788 **APTIC NO. 68529**

Oikawa, Kikuo, Yoshikazu Hashimoto, and Saburo Yanagisawa

MEASUREMENT METHODS OF METALS IN ATMOSPHERIC PARTICULATE METHODS. *(Taiki fuyu ryushijo busshitsuchu no kinzokuseibun no bunseki hoho). Text in Japanese. Bunko Kenkyu (Res. Spectroscop.), 23(3):111-127, 1974. 16 refs.*

The principles and formats of various measurement methods, samplers, and analytical methods for metals in suspended particulates are discussed. The equipment discussed includes rotary compressors, flowmeters, samplers, and filters. The analytical methods discussed are emission spectroscopy, atomic absorption spectrophotometry, neutron activation analysis, and fluorescent X-ray analysis. The selection of the analytical method depends on the composition of the air and the location of sampling. Depending on the location, air samples tend to yield large fluctuations in their consistencies. For such locations, methods are required that enable simultaneous quantitation and identification. For this purpose, emission spectrometry, activation analysis, and fluorescent X-ray analysis are advantageous. But atomic absorption spectrophotometry is advantageous in its simplicity and high accuracy. With the activation analysis method, the following elements have been successfully analyzed: sodium, magnesium, aluminum, silicon, chlorine, potassium, calcium, scandium, titanium, vanadium, manganese, iron, cobalt, nickel, copper, zinc, gallium, arsenic, selenium, bromine, antimony, cesium, barium, lanthanum, samarium, europium, ytterbium, lutenium, hafnium, tantalum, mercury, tungsten, lead, and thorium.

45789 **APTIC NO. 68844**

Osborne, Michael C.

TEN COMMON ERRORS AND MISCONCEPTIONS IN SOURCE SAMPLING. *Louisville Univ., Speed Scientific School, Ky.; International Assoc. for Pollution Control; American Chemical Society, Washington, D. C.; American Inst. of Chemical Engineers, New York; American Inst. of Industrial Engineers, New York; American Society of Civil Engineers, New York; American Society of Mechanical Engineers, New York; American Water Works Assoc., New York; Inst. of Electrical and Electronic Engineers, New York; and Water Pollution Control Assoc., Environ. Eng. Sci. Conf., Annu. Meet., Louisville, Ky., 1974, p. 693-699. 4 refs. (March 4-5.)*

Some of the common pitfalls in source sampling are described. The sensible approach to reliable source sampling is that in which specified procedures are meticulously thought out, conducted in a scientific manner, and analyzed in depth at the end of the study. The following ten errors and misconceptions in source sampling are the most prevalent with stack samplers today: the common conceptual error of assuming the pitot tube coefficient to be 0.85; the assumption that if a sample box operated at 250 F is good then one set at 500 F would be better; unshakeable faith in equipment manufacturers specifications -- often nomographs are incorrect; the assumption that all stacks are either round or rectangular in cross-section; the assumption that with only two ports, a 5-foot probe can be used to sample a stack that is 5 ft in diameter; unfamiliarity with equipment; the assumption that any standard 110 or 120 volt outlet is satisfactory to operate the sampling train; the assumption that glass probes will meet any needs which arise; the belief that changing nozzles during a test is permissible, provided the change is properly noted; the misconception that after completing several uniquely different source tests, the sampler may conclude that there is little he has not experienced in the realm of source sampling.

45790 **APTIC NO. 69023**

Otsuki, Masaharu

FLUE GAS NITROGEN OXIDE ANALYZER BY POTENTIOMETRIC METHOD. *(Teideni denkaiho ni yoru endo haigasuchu no chisso sankabutsu bunsekikei). Text in Japanese. (Sangyo Kogai (Ind. Public Nuisance), 10(9):35-40, Sept. 1974. 3 refs.*

The principles of the constant potentiometric electrolysis are explained, and a nitrogen oxide analyzer based on these principles, the structure, the mechanism, interference elements, application limits, oxygen analysis in flue gas using this apparatus, and the design specifications for flue gas analyzers and gas samplers, are discussed. The main interfering elements for NOx analyzers in stack gases are sulfur dioxide, ammonia, hydrogen sulfide, carbon monoxide, and aromatic hydrocarbons. The H2S and SO2 can be eliminated by a hydrogen peroxide solution or an alkaline carbonate solution. The SO2 removal rate by alkaline carbonate is almost 100%. The ratio of interference by ammonia is considerable; but in an ordinary boiler flue gas, there is no large quantity of ammonia, and there should be no real problem. The ratio of CO interference is 0.1-0.2% when the potential is regulated correctly; but with changes of potential, the errors can increase to 3-5%. For a maximum of 1000 ppm of CO in a regular power plant boiler gas, a correctly set potentiometer should give no problem. But when the CO content is as high as in automotive exhaust gases, the application of this meter will be difficult. Aromatic HC interference is positive and fairly high; the meter will not be applicable to diesel combustion engine gases. Water and carbon dioxide give no interference, and a pretreatment or a complete dehumidation will not be necessary. A drainage and mist removal will be enough. The sensitivity of this analyzer is different for nitric oxide and nitrogen dioxide, and the measurement error could be as much as 10%. When the NO content in the stack gas is about 90%, there is no problem; but with the increase of NO2, the error will increase.

45791 **APTIC NO. 68842**

Ott, Wayne and David Mage

TREND ASSESSMENT OF AIR QUALITY OVER LARGE PHYSICAL AREAS BY RANDOM SAMPLING. *Louisville Univ., Speed Scientific School, Ky.; International Assoc. for Pollution Control; American Chemical Society, Washington, D. C.; American Inst. of Chemical Engineers, New York; American Inst of Industrial Engineers, New York; American Society of Civil Engineers, New York; American Society of Mechanical Engineers, New York; American Water Works Assoc., New York; Inst. of Electrical and Electronic Engineers, New York; and Water Pollution Control Assoc., Environ. Eng. Sci. Conf., Annu., Meet. Louisville, Ky., 1974, p. 657-676. 5 refs. (March 4-5.)*

Examination of air quality trends over time generally requires obtaining estimates, with known precision, of the average annual concentration of a given air pollutant. Since continuous monitoring is relatively costly and does not guarantee that the point chosen is representative of a large geographical area, collection of a small number of random samples at several locations may offer a better means of obtaining representative, less expensive, samples. To determine the feasibility of random sampling approaches, a computer program was developed using data from the Bay Area Air Pollution Control District air monitoring station in San Jose, California. Four sample groups of different size were drawn from the 8760 hourly average carbon monoxide values for the year June 1, 1970 to June 1, 1971. The computer randomly picked a day of the year and an hour of that day. Computer results were than compared with theory. Data from other cities were also examined. The results using data from many cities and an example from one city demonstrated that random sampling approaches yield relatively precise estimates of long- term mean CO concentrations with a small number of samples. Both nationally and in San Jose, sample sizes on the order of 100 can produce a 95% confidence interval within + or - 1 ppm CO. In San Jose, this precision was obtained in most cases for sample sizes of only 50. The cost of continuous monitoring at nine sample locations would have been about $96,000. With random sampling, the cost would be about $24,000. While the random sampling approach is not suited to determining short-term measurements, the approach is appropriate for measuring long-term air quality trends which compare annual average concentrations over time or for studies intended to map concentration isopleths for verification of diffusion models, land use planning, siting monitoring stations, or general air quality surveys.

45792 **APTIC NO. 68579**

Owens, Edward J.

DEVELOPMENT OF A PORTABLE ACOUSTIC ECHO SOUNDER. *National Oceanic and Atmospheric Administration, Boulder, Colo., Environmental Research Labs., NOAA-TR ERL 298-Wave Propagation Laboratory 31, 46p., May 1974. 9 refs.*

GPO

The design and construction of an inexpensive, portable, monostatic acoustic echo sounder called the Suitcase Sounder are described. The sounder consists of three major components: control unit, antenna unit, and the preamplifier. The sounder is used for monitoring atmospheric temperature fluctuations by measuring backscattered echoes of acoustic tone bursts. The equipment can be utilized for monitoring temperature inversions and convective plumes for use in predicting air pollution alerts. The capability also exists for extracting C subscript T information in more extensive operations and for monitoring vertical wind velocities from the resultant Doppler shift in the monostatic mode of operation. (Author abstract modified)

45793 **APTIC NO. 69152**

Parts, Leo, John V. Pustinger, William D. Ross, Arthur D. Snyder, Henry H. S. Yu, Robert E. Sievers, and Joseph J. Brooks

AN ASSESSMENT OF INSTRUMENTATION AND MONITORING NEEDS FOR SIGNIFICANT AIR POLLUTANTS REMITTED BY AIR FORCE OPERATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH ON ANALYSIS OF POLLUTANTS. *Monsanto Research Corp., Dayton, Ohio, Air Force Contract F33615-72-C-1304, Program Element 70230407, Rept. ARL 74-0015, 184p., Feb. 1974. 372 refs.*

NTIS, DDC: AD 778938

Air pollution monitoring needs of the Air Force are considered in terms of presently used instrumentation and the development of new techniques to meet specific requirements. Recommendations regarding instrument development are given for the following areas of pollution monitoring: volatile aircraft emissions (carbon monoxide, nitrogen oxides, hydrocarbons, exhaust odors); particulate aircraft emissions (particle size distribution, smoke number, mass emission, optical transmission); emissions related to missile storage facilities and missile test and launching sites (hydrogen chloride, hydrogen fluoride, hydrazine, nitrogen oxides); metallic element emission sources; herbicide incineration emissions; and ambient air measurements. General recommendations are given for areas where fundamental research is vitally important.

45794 **APTIC NO. 68604**

Reilly, Hugh T. and Gilbert Newcomb

ACQUISITION OF SMALL NO2 SOURCES WITH A UV CORRELATION SPECTROMETER (FINAL REPORT). *Army Land Warfare Lab., Aberdeen Proving Ground, Md. Applied Chemistry Branch, and Environmental Measurements, Inc., Annapolis, Md., USALWL Task 05-C-70, TR-LWL-CR-05C70A, 25p., Feb. 1974.*

NTIS, DDC: AD 776378

The feasibility of remotely sensing nitrogen dioxide emissions from a single source was explored using an ultraviolet correlation spectrometer manufactured by Barringer Research Ltd., Toronto, Canada. Detections were made of exhaust from a 2.5 ton truck at 200 m range and a 30 kw diesel generator at 1050 m range to demonstrate feasibility of detecting small sources of NO2. (Author abstract)

45795 **APTIC NO. 66209**

Robinson, D. C., N. E. Whitehead, and G. E. Coote

PROTON INDUCED X-RAY FLUORESCENCE ANALYSIS AND ITS USES IN MEASURING AIR POLLUTION. *Chem. N. Z., 38(3):81-84, June 1974. 10 refs.*

Proton induced X-ray fluorescence analysis is described, and the application of this technique to air filter analysis is discussed. The external source used in experiments was a beam of protons from a 3 MV Van de Graaff accelerator. Filters were mounted on a piece of carbon to improve electrical conductivity and analyzed with the detector mounted about 8 cm from the filters. Typically each spectrum was accumulated for about 3 min. The peak areas in each spectrum were extracted using a PDP-11/20 computer. Two series of measurements were done, one using a proton energy of 2.5 MeV and the other of 1.0 MeV. The analytical technique was a sensitive and useful technique for the analysis of trace elements. With a bombarding time of a few minutes, most of the elements in the periodic table down to weights of around 100 ng/sq cm could be measured. The most sensitive region was centered on nickel, the least sensitive on cadmium. The experiment showed that concentrations of lead and bromine in the air change throughout the day. The constant lead/bromine ratio suggested that both elements originated from motor vehicles.

45796 **APTIC NO. 69074**

Rodes, Charles E.

A COLORIMETER SYSTEM FOR DETERMINATION OF THE METHOD 6 THORIN TITRATION ENDPOINT. *Am. Chem. Soc., Div. Environ. Chem., Prepr., 14(1):313-320, 1974. 2 refs. (Presented at the American Chemical Society, Division of Environmental Chemistry, National Meeting, 167th, Los Angeles, Calif., April 1-5, 1974, Paper 60.)*

A colorimeter system for determination of the method 6 thorin titration endpoint in the analysis of stack concentrations of sulfur dioxide was developed. A simple fixed wavelength optical system was designed that was sensitive to the change from before to after the endpoint. The colorimeter output can be displayed on a recorder for a permanent record, and samples can be titrated rapidly with the determination of titrant volumes made at a later time. The performance of the metering pump is critical to the system. For portability a voltmeter and a stopwatch can be used instead of the recorder as the endpoint indicator, if an accuracy of 2-3% is acceptable as compared with 0.5 to 1.0% with the recorder. Titrations of actual Method 8 samples show that the accuracy of the system as compared with manual titration, and the precision are excellent. (Author conclusions modified)

45797 **APTIC NO. 69075**

Rook, Harry L., Ernie E. Hughes, Robert S. Fuerst, and John H. Margeson

OPERATION CHARACTERISTICS OF NO2 PERMEATION DEVICES. *Am. Chem. Soc., Div. Environ. Chem., Prepr., 14(1):321-328, 1974. 7 refs. (Presented at the American Chemical Society, Division of Environmental Chemistry, National Meeting, 167th, Los Angeles, Calif., April 1-5, 1974, Paper 61.)*

The operational characteristics of a newly designed nitrogen dioxide permeation device developed at the National Bureau of Standards were investigated. Parameters studied include temperature, humidity, physical shock, NO2 purity, and calibration procedures. The permeation rate equilibration stability was influenced by large changes in temperature, high temperature, trace water content of the condensed NO2, teflon to glass seal integrity, and humidity of the diluent gas. A series of tubes were calibrated for 30 days gravimetrically and then calibrated by comparison to NO2 generated by gas phase titration of nitric oxide with a standardized ozone generator. The primary standardization of the O3 generator was conducted using the environmental Protection Agency reference KI method. The agreement between calibration methods was excellent.

45798 **APTIC NO. 68346**

Rosen, H., P. Robrish, and O. Chamberlain

FEASIBILITY OF THE REMOTE DETECTION OF POLLUTANTS USING RESONANCE RAMAN SCATTERING. *California Univ., Berkeley, Energy and Environment Div., Lawrence Berkeley Lab.-3215, 15p., Oct. 1974. 34 refs.*

Calculations of the resonance Raman cross-section for several diatomic molecules are presented and used along with recent measurements of large resonance enhancements in nitrogen dioxide and sulfur dioxide to estimate the sensitivity of a lidar system based on the resonance Raman effect. Resonance Raman cross-sections are tabulated for carbon monoxide (plus 1 and neutral state), the hydroxyl radical, sulfur oxide, nitric oxide, iodine, sulfur dioxide, bromine, nitrogen dioxide, and chlorine. Lidar sensitivity versus range data indicate that, with the marginal exception of daylight detection of NO2, a lidar system making use of resonance Raman scattering can easily detect the pollutant concentrations typical of smoke plumes (greater than 10 ppm) at a range of a few hundred meters using lasers with only very modest energies. Also the advantages in sensitivity and safety associated with the use of resonance enhancements in a Raman lidar system outweigh the additional problems associated with the use of a tunable laser as a lidar transmitter.

45799 **APTIC NO. 68559**

Rudolph, H., J. J. Kraushaar, R. A. Ristinen, and Robert R. Meglen

DETERMINATION OF TRACE AMOUNTS OF FLUORINE BY NUCLEAR INELASTIC SCATTERING. *Missouri Univ., Columbia, Trace Subst. Environ. Health, Proc. Univ. Mo. Annu. Conf., 7th, Columbia, Mo., 1974, p. 313-321. 23 refs.*

The detection of inelastic scattering of energetic protons to the first (110 keV) and second (197 keV) excited states of fluorine (19) is a sensitive tool for detecting trace amounts of fluorine in a large variety of environmental and biological samples. Gamma rays following inelastic excitation of fluorine nuclei are observed with a lithium-drifted germanium detector of 1.8 keV resolution. With the method, the minimum detectable amount is approximately 10 ng, assuming a 15 minute irradiation of the sample with a 4.8 MeV proton beam of current density of 0.5 microA/sq cm. Obvious improvements in experimental parameters such as detector geometry and shielding and the use of a low-volume, high resolution detector could improve this result by a factor of 10. Results of some in vestigations are presented, and applications of the method are discussed. The method is useful to determine fluorine in coal, teeth, water, vegetation, and other environmental samples. The advantages of the technique are that minimal sample preparation is required and that very small amounts of material may be analyzed. (Author abstract modified)

45800 **APTIC NO. 68646**

Sadeh, Willy Z.

FEASIBILITY OF REMOTE EVAPORATION AND PRECIPITATION ESTIMATES (TOPICAL REPORT). *Colorado State Univ., Fort Collins, National Aeronautics and Space Administration Contract NAS 8-28590, NASA CR-129023, 30p., April 1974. 19 refs.*

NTIS: N74-21235

Preliminary field experiments were conducted to demonstrate the feasibility of stereoscopic remote sensing of polluted air masses using flown stereo cameras. Evaluations of the planar extent of smoke plume based on both stereo images and ground measurements (hot wire anemometer technique) were in reasonable agreement. The windwise extent of the plume measured was roughly 70 ft. Analysis of a stereo-image pair can be used to establish the features of a moving polluted air mass provided that the condition of stereoscopic stationarity is satisfied. The plume is assumed to be steroscopically stationary when the distance traveled by the plume during the time lapse between two successive exposures is small compared with its overall horizontal extent. This situation usually occurs within the temperature inversion layer, under light winds or calm conditions. Standard stereo comparison analysis is generally limited due to variations in the concentration of pollutants within the plume, the haze of the plume, and the continuous changing optical background.

45801 **APTIC NO. 68473**

Saito, Hiroshi

THE ANALYSIS OF ALDEHYDES IN GASES DISCHARGED FROM AUTOMOBILES. *(Jidosha haiki gas chu no aldehyde no bunseki). Text in Japanese. Bunseki Kiki (Analysis Instr.), 12(6):357-363, June 1974. 25 refs.*

Conventional methods of determination of aldehydes are the chromotrobe method, the p-rosaniline method, the acetyl acetone method, and the hexyl resorcinol method. For the determination of the total amount of various aldehydes the 3-methyl-2-benzothiazoronhydrazone method and 2,4-dinitrophenyl hydrazine (DNPH) method are used. For separate determination of each aldehyde the sodium hydrogen sulfite method, the direct gas-chromatographic method, the oxime method, and chromatography of hydrazone are used. Besides these conventional methods, gas chromatographic analysis of hydrazones (DNPH-GC method) and high speed chromatography of hydrazone have been used recently. According to the DNPH-GC method the aldehydes in discharged gases are collected in midget impingers. The concentration of aldehydes in discharged gases is usually of the order of 10 ppm and 100 ppm at the most. About 5-40 l of discharged gas is passed through the impinger. The hydrazones thus formed are dissolved with a known amount of methylene chloride. Several carbonyls cannot be separated and determined by the DNPH-GC method. These are successfully determined by the application of 2-step gas chromatography.

45802 **APTIC NO. 68438**

Sakai, Kaoru

CONTINUOUS MEASUREMENT OF AIR POLLUTANTS BY ULTRAVIOLET ABSORPTION METHOD. *(Shigaisen kyushuho ni yoru gasujo osen busshitsu no renzoku sokutei). Text in Japanese. Sangyo Kogai (Ind. Publ. Nuisance), 10(9):2142-2148, Sept. 1974.*

Ultraviolet absorption photometry is divided into light scattering and non-scattering methods, and into the categories of light band, single light band, and complex light band. The single band equipment is simple in structure and maintenance but is affected by blank fluctuations. The complex method is theoretically compensated for the blank; but actually the soiling of the two measurement cells might cause errors. In normal boiler combustion gases, nitric oxide, nitrogen dioxide, and sulfur dioxide coexist. When measuring gas by ultraviolet absorption there is no problem with SO2 and NO2 measurement; but NO measurement is affected by SO2 absorption. To avoid this, NO in the combustion gas can be oxidized into NO2 by ozone oxidation thermolysis or by oxygen pressure oxidation; in addition, correlation spectrometry or multiwavelength calculation equipment can be used for compensation of SO2 interference. All these adjustment equipments are now included in the revised JIS K0104. Ultraviolet absorption of ozone has its peak in the area of 250-260 nm, and is relatively free of interference by coexisting material in the air. Ozone oxidation thermolysis, double wavelength spectrophotometry, and correlation spectrometry are discussed, and the ultraviolet ozone analyzer, fluorescence meter, and laser are briefly mentioned.

45803 **APTIC NO. 68441**

Sakata, Mamoru and Wataru Tsuruta

CONTINUOUS ANALYSIS OF NITROGEN OXIDES BY CHEMILUMINESCENCE METHODS. *(Kagaku hakkoho ni yoru chisso sankabutsu no renzoku bunseki hoho). Text in Japanese. Sangyo Kogai (Ind. Publ. Nuisance), 10(9):2160-2166, Sept. 1974.*

The characteristics of chemiluminescence methods of continuous nitrogen oxide analyses are: high sensitivity, quick responses, good linearity, and simple structure mechanism. If these advantages are used in devicing a nitrogen oxide analyzer the quality should be superior. The chemical reactions of the nine known chemiluminescent phenomena are presented. The most popular chemiluminescence NOx meter is based on the principle of the nitric oxide-ozone reaction, and it is actually a meter for NO. In order to get the maximum sensitivity, the reaction chamber should be under a reduced pressure and minimize the quenching phenomenon. For this a vacuum pump is necessary. Chemiluminescence is basically advantageous because of relative freedom from interferences of other substances in test gases. However, there are positive and negative interferences which are easy to control: positive interferences occur when coexisting gases react to ozone and emit light; negative interferences occur by quenching, mainly by excited nitrogen dioxide reacting with carbon dioxide. There is very little problem with the positive interference when the concentrations of olefins and sulfides in the test gas are known. Negative interferences affects the NO concentration 3 to 7% when CO2 is about 10%. The structure, sampling equipment, analytical equipment, and indicator- recorders are described.

45804 **APTIC NO. 68722**

Sakata, Mamoru and Wataru Tsuruta

CONTINUOUS ANALYSIS OF NITROGEN OXIDES BY CHEMILUMINESCENCE METHODS. *(Kagaku hakkoho ni yoru chisso sankabutsu no renzoku bunseki hoho). Text in Japanese. Sangyo Kogai (Ind. Publ. Nuisance), 10(9):2160-2166, Sept. 1974.*

The characteristics of chemiluminescence methods of continuous nitrogen oxide analyses are: high sensitivity, quick responses, good linearity, and simple structure mechanism. If these advantages are used in devicing a nitrogen oxide analyzer the quality should be superior. The chemical reactions of the nine known chemiluminescent phenomena are presented. The most popular chemiluminescence NOx meter is based on the principle of the nitric oxide-ozone reaction, and it is actually a meter for NO. In order to get the maximum sensitivity, the reaction chamber should be under a reduced pressure and minimize the quenching phenomenon. For this a vacuum pump is necessary. Chemiluminescence is basically advantageous because of relative freedom from interferences of other substances in test gases. However, there are positive and negative interferences which are easy to control: positive interferences occur when coexisting gases react to ozone and emit light; negative interferences occur by quenching, mainly by excited nitrogen dioxide reacting with carbon dioxide. There is very little problem with the positive interference when the concentrations of olefins and sulfides in the test gas are known. Negative interferences affects the NO concentration 3 to 7% when CO2 is about 10%. The structure, sampling equipment, analytical equipment, and indicator- recorders are described.

45805 **APTIC NO. 69076**

Schwarz, Frederick P. and Hideo Okabe

THE FLUORESCENCE DETECTION OF NITRIC OXIDE. *Am. Chem. Soc., Div. Environ. Chem., Prepr., 14(1):336-343, 1974. 6 refs. (Presented at the American Chemical Society, Division of Environmental Chemistry, National Meeting, 167th, Los Angeles, Calif., April 1-5, 1974, Paper 63.)*

A technique for the detection of nitric oxide in NO-nitrogen mixtures is described. It is based on measuring the intensity of the fluorescence of NO excited by light of wavelength, 2138A. A similar technique was applied to the measurement of sulfur dioxide in air at the ppb level. Measurements in flow systems were performed for concentrations in the 10 ppm range of NO in N2. They duplicate the precision and linearity for the static measuring system. The range of nitrogen oxides concentrations in automobile exhaust is from 30-3000 ppm. There is N2, 10% carbon dioxide, 13% water, a maximum 2% hydrogen, a maximum 5% carbon monoxide, and hydrocarbons and NOx in the ppm range. The quenching effects of these compounds on the NO fluorescence were studied. The results are tabulated. If the sample is diluted by N2 gas by a factor of 100 to 1 in a flow system prior to measurement, the quenching effects of these gases can be minimized. The NO fluorescence signal is quenched to approximately 10% of its value in pure N2. Variations in CO and CO2 concentrations cause a total of 6% variation in the NO fluorescence signal. If the CO2 is removed by a scrubber, this variation would be 3%. A dilution by 1 to 100 would reduce the NO concentration to the 100 ppb range.

45806 **APTIC NO. 68752**

Segar, D. A.

FLAMELESS ATOMIC ABSORPTION GAS CHROMATOGRAPHY. *Anal. Letters, 7(1):89-95, 1974. 4 refs.*

A flameless atomic absorption gas chromatographic system for detecting the concentration of organometallic compounds is described. An atomic absorption spectrophotometer equipped with a heated graphite atomizer is used as the detector, with the atomizer modified to permit continuous variation of the ashing temperature up to the maximum offered by the atomizer. The gas chromatograph consists of a thermally insulated resistance heated box which contains the column. Tests of the system with samples of commercial gasolines, standard lead alklyl compounds, and a lead alkyl mixture show a sensitivity of analysis for lead as its trimethylethyl compound of about 5 micrograms Pb/ml for a 2 microliter injection. This sensitivity is not as good as that obtained by solution injection into a flame atomizer, but only very small samples are required for gas chromatography. The potential of the flameless atomic absorption gas chromatograph in organometallic analysis is limited only by the requirement for volatile compounds and by the relatively poor sensitivity. Developments are in progress which offer hope of alleviating these two limitations.

45807 **APTIC NO. 68937**

Smith, Franklin, Denny E. Wagoner, and A. Carl Nelson, Jr.

GUIDELINES FOR DEVELOPMENT OF A QUALITY ASSURANCE PROGRAM: VOLUME III - DETERMINATION OF MOISTURE IN STACK GASES. *Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1234, ROAP 26BGC, Program Element 1HA327, Rept. EPA-650/4-74-005-c, 72p., Aug. 1974. 10 refs.*

Guidelines are presented for the quality control of moisture in stack gases by the Federal reference method. These include: good operating practices, directions on how to assess performance and quality data, directions on how to identify trouble and improve quality, and directions to permit design of auditing activities. Manuals are given for operations, for the field team supervisor, and for groups of field teams. (Author abstract modified)

45808 **APTIC NO. 68915**

Smith, W. B., K. M. Cushing, and J. D. McCain

PARTICULATE SIZING TECHNIQUES FOR CONTROL DEVICE EVALUATION (SUMMARY REPORT). *Southern Research Inst., Birmingham, Ala., Environmental Protection Agency Contract 68-02-0273, Program Element 1AB012, ROAP 21ADM-011, Rept. EPA-650/2-74-102, SRL Rept. SORI-EAS-74-138, 127p., Oct. 1974. 26 refs.*

The feasibility of measuring particle size distributions in stack gases of from 0.01 to 15 micron was tested. A first- generation system is described that represents a viable package that can be improved and will continue to be useful in making these extremely important measurements related to the control of fine particles. Three techniques were used to measure particle size distributions in industrial plant environments under a variety of conditions: cascade impactors in the particle size range 0.5-20 micron; diffusion batteries and condensation nuclei counters in the 0.01-0.2 micron range; and optical counters in the 0.3-2 micron range. The stage collection efficiencies of several impactors and cyclones were also measured in the laboratory. A vibrating-orifice aerosol generator was used for calibration. With careful use, cascade impactors can give reliable particle size information; however, no single impactor was versatile enough to measure accurately under the extreme grain loading variations found between control device inlets and outlets. Stage collection efficiencies of all impactor stages tested (except one) agreed fairly well with the theory of Rantz and Wong. Diffusional sizing was practical with diluted samples; although it is tedious and time consuming, it is most accurate for sources with relatively stable particle size distribution and concentration. (Author abstract) and concentration. (Author abstract)

45809 **APTIC NO. 68624**

Stedman, D. H. and G. L. Kok

CHEMILUMINESCENT MEASUREMENT OF ATMOSPHERIC ACID (FINAL REPORT). *Michigan Univ., Dept. of Atmospheric and Oceanic Science and Space Physics Research Lab., National Aeronautics and Space Administration Grant NGR23-005-599, 41p., May 6, 1974. 11 refs.*

NTIS: N74-22281

The design and construction of a gas phase acid sensitive analyzer is described. The laboratory work done on the various components of the system showed that the chemical system was a practical analytical method. A complete instrument was developed and prepared for field testing. The instrument was used to monitor the hydrochloric acid concentration in the exhaust from a Titan III-C rocket, but detected no acid due to adverse wind conditions. The entire instrument was further evaluated. Operating instructions, construction details and calibration are described. In the gas phase acid selective inlet system constructed for a chemiluminescent nitric oxide analyzer used to analyze gaseous and aerosol hydrogen chloride, the sample stream is mixed with a 9 ppm flow of ammonia, the resulting ammonium salt is filtered off, and the remaining ammonia is catalytically converted to NO. The acid concentration is measured as the net decrease in the NO concentration. The only interferences are nitrogen-containing compounds. The limit of sensitivity of the method is about 0.05 ppm.

45810 **APTIC NO. 68593**

Steffenson, D. M., D. H. Stedman, and D. J. Patterson

EFFECT OF FUEL ADDITIVES STUDY (FINAL REPORT). *Michigan Univ., Ann Arbor, Coll. of Literature, Science, and the Arts and Michigan Univ., Ann Arbor, Coll. of Engineering, Environmental Protection Agency Grant R-802419-01, ROAP 26AAE-24, Program Element 1AA002, Rept. EPA-650/2-74-096, 50p., May 1974. 13 refs.*

Studies were conducted on the optimization of a chemiluminescent nitric oxide detector. The detector was used to study the effect of a nitrogen-containing fuel additive on combustion using a gas chromatographic technique. Progress so far indicates the detector is N-selective in gas chromatic determination down to 1.6 ng of diethyl nitrosamine (approximately 0.5 ppm in a 1 ml gas sample). Similar data were obtained for amines. The detector has at least two orders of magnitude more sensitivity currently not realized due to problems with the gas chromatographic columns. Preliminary studies were made of rapid determination of total N in gasoline and of combustion products in a flat flame propane- air burner. (Author summary modified)

45811 **APTIC NO. 68998**

Tanaka, Tatsuo and Masashi Matsumoto

RECENT AIR SAMPLING FILTER PAPERS. *(Saikin no ea sanpuringu roshi ni tsuite). Text in Japanese. Bunseki Kiki (Analysis Instr.), 12(6):327-356, June 1974. 18 refs.*

Sampling filter paper must have high collection rate, high load capacity, small pressure loss, limited amounts of impurities to avoid interference, light weight, constancy of weight, easy separation of sampled substances, strength, heat resistance, and no hygroscopicity or gas adsorption. The dust collection efficiency of cellulose filters is lower than that of glass fiber because the cellulose fiber itself is thick. For instance, Toyo Filter Paper No.1 collects 90% of 2-micron particles at the speed of 23.5 cm/sec, but only 70% of 1 micron particles, and almost none of 0.5 micron particles. The collection rate is about 40-50% of membrane filters. Advantages are the mechanical and physical strength, large load for high volume air sampling, and high adaptability. For instance, when collecting lead or cadmium, two or three cellulose filter paper layers filtering through dusts and extracted by acid will collect 99.5-99.9% of microparticle Pb and Cd fume. The collection rate of cellulose asbestos filter paper is superior and is about same as glass fiber. But the contained metals and salts interfere with analyses of dust composition. Glass fiber is more expensive than cellulose but less than membrane filters; it is heat refractory and has chemical resistance. The collection performance depends completely on the diameter of glass fibers. Compared to the abovementioned three types of filters, a membrane filter is accurate in distribution and size of pores, and the surface collectivity is excellent. For dust sampling, the 0.8-1 micron filter is most frequently used. The collection rate for 0.3 micron stearic acid by a 0.8 micron membrane filter is 99.99%.

45812 **APTIC NO. 68481**

Tsuruta, Osamu

ACCURACY AND MAINTENANCE OF CHEMICAL EMISSION TYPE NOX METER. *(Kagaku hakkoshiki NOx-kei no seido iji to maintenance ni tsuite). Text in Japanese. Keiryo Kanri Keisoku Keiso (J. Instrum. Control Assoc., Japan), 23(5):213-215, May 1974.*

This instrument gives data which are independent of the presence of different gases except carbon dioxide. The presence of CO2 has a negative effect on the nitric oxide data. For example, 10-15% CO2 alters the reading of 100 ppm NO by -3 to -5 ppm. Because instrumental analysis depends upon relative determination, it is important to exactly calibrate the zero and span simultaneously with the use of standard gas. It is important to pay attention to the leakage of gases from the vessel. The chemical emission type nitrogen oxide meter is essentially an NO meter. Therefore, it is necessary to convert nitrogen dioxide into NO by means of an NO2-NO converter. For the correct measurement of NO2, it is necessary to inhibit the adsorption of NO2 in the sampling line and to use a converter of high conversion efficiency. The converter usually makes use of a catalyst and reduces NO2 at 250-350 C. A periodical check of the catalyst is necessary because the catalyst deteriorates with time. Precautions in the use of the instrument are given for various parts such as the probe, primary filter, gas inlet line, humidity remover, sampling pump, secondary filter, detector, ozonizer, reaction vessel, amplifier, and power supply.

45813 **APTIC NO. 68501**

Urone, Paul

SOURCE AND AMBIENT AIR ANALYSIS FOR SULFUR TRIOXIDE AND SULFURIC ACID: A STATE-OF-THE-ART REPORT. *Health Lab. Sci., 11(3): 246-255, July 1974. 42 refs.*

The current status of methods for sampling and analyzing emissions containing sulfur trioxide and sulfuric acid mist from various stationary sources and ambient air is reviewed. Probably the greatest weakness of presently known and used methods for measuring these emissions is the sampling method. There is a need for more research and more field work to establish more exactly the conditions necessary for recovery of a high percentage of the acid and its anhydride in the presence of relatively large amounts of sulfur dioxide and other interfering substances. The Environmental Protection Agency's absorption method using isopropyl alcohol (IPA) is giving trouble in field trials. Maintenance of the concentration and total volume of the sampling solution is difficult. There is also evidence of oxidation of SO2 in the IPA solution. At this point it is not clear whether this does or does not depend on how well the SO2 is purged from the sampling solution. The condensation and filtering (or impingement) technique must be investigated more thoroughly. There are questions about the completeness of the condensation and the efficiency of collecting the condensate under field conditions which must be answered. The analytical, or measurement, steps of the various methods in themselves seem to be satisfactory when allowances are made for the limitations of the sampling procedure used. These analytical methods include sodium hydroxide titration, barium ion titration, chloranilate method, turbidimetric methods, and the flame photoluminescent detector. (Author summary modified)

45814 **APTIC NO. 68901**

Varga, G. M., Jr.

VAPOR DETECTOR (FINAL REPORT). *Esso Research and Engineering Co., Linden, N. J., Army Missile Command Contract DAAH01-73- C0137, Esso Rept. GRU.1DJAE.74, TR-RK-CR-74-8, 25p., Feb.15, 1974. 3 refs.*

NTIS, DDC: AD780171

This feasibility study showed that coated piezoelectric crystals can detect quantitatively vapors of unsymmetrical dimethyl hydrazine (UDMH) in the presence of a background level of humidity which might be encountered by a soldier in the field. The UDMH levels detected ranged from 2 to 115 ppm. Four crystal coatings which were effective were members of the acrylonitrile-butadiene and styrene-butadiene copolymer families. Crystals coated with these polymers also monitored water vapor quantitatively. Sensor response was sufficiently rapid so that piezoelectric instrumentation could be utilized to sound an alarm for UDMH instantly and could determine the UDMH concentration quantitatively in 1 min or less. The piezoelectric instrumentation was also capable of differentiating between minute differences in UDMH levels such as 30 and 31 ppm UDMH. This method can be used to determine if the liquid fuel and/or oxidizer are leaking from Lance missiles deployed in the field. Although the detector may be used to detect nitrogen dioxide vapors, this aspect was not studied. (Author abstract modified)

45815 **APTIC NO. 68721**

Wakimoto, Tadaaki, Ryo Tachikawa, Tsunehiko Ogawa, and Isao Watanabe

METHOD FOR THE QUANTITATION OF ORGANIC CHLORINE COMPOUNDS IN THE AIR BY THE DRY SAMPLING METHOD. *(Kanshiki saiki ho ni yoru taikichu no yuki enso kagobutsu no teiryoho). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 23(7):790-793, July 1974. 4 refs.*

Air containing organochlorine compounds such as BHC (benzene hexachloride) and PCB (polychlorinated biphenyl) was sampled using a glass tube packed with 5 to 10 g of Fluorisil coated with 5% (w/w) of glycerine. The compounds adsorbed on the Fluorisil were eluted with 50 to 100 ml of methyl alcohol, and the solution was shaken with 100 ml of n-hexane. About 500 ml of water saturated with n-hexane was then added and the mixture was vigorously shaken for 10 sec. The organic layer was washed three times with water and was concentrated to about 5 ml. The compounds were then analyzed by gas chromatography using an electron capture detector and N2 as carrier gas. The column for compounds other than PCB was 4 mm by 2000 mm glass tube packed with 1.5% OV-17 and 2% QF-1 or 1.5% DEGS and 0.5% phosphoric acid on chromosorb W, and that for PCB was 2% OV-1 on chromosorb W. The limit of detection for BHC (4 compounds) was 0.0005 microgram/cu m and that for PCB was 0.002 microgram/cu m. With minor modifications this collection method was applicable to other air pollutants such as organophosphorus compounds and phthalic acid esters.

45816 **APTIC NO. 69067**

Warner, Peter O. and James O. Jackson

PRACTICAL AND THEORETICAL ASPECTS OF ODOR MONITORING. *Am. Chem. Soc., Div. Environ. Chem., Prepr., 14(1):193-198, 1974. (Presented at the American Chemical Society, Division of Environmental Chemistry, National Meeting, 167th, Los Angeles, Calif., April 1-5, 1974, Paper 38.)*

Practical and theoretical aspects of odor perception and measurement are described. The evaluation of odors as pollutants is dependent upon odor quality and intensity. Olfactory nerve endings signal the more complex brain centers where stimuli are interpreted in terms of the kind and intensity of odor. Molecular size, shape, and chemical structure account for the seven primary types of odors which are etheral, camphorous, musk-like, floral, pungent, minty, and putrid. Dilution methods for odor determination require the quantitative dilution of odorous air with odor-free air by successive batch dilutions until panel subjects exposed to these dilutions can no longer smell the odor. The operation and effectiveness of the panel method and the ASTM syringe method for measuring the odor strength from source samples are described. Community and odor regulations and comparative studies are reviewed. Approximately 40 to 150 ou/cu ft constitutes a safe static level or odorant, one which produces no complaint problem. A high emission rate of odor, i.e., in excess of 1,000,000 ou/min can produce a nuisance level of odor in the community even though the static odor content of the emission is acceptable.

45817 **APTIC NO. 69174**

Yanagisawa, Saburo

MECHANICAL ANALYSIS METHOD FOR AIR POLLUTANTS AND ITS TREND. *(Taiki osen busshitsuo no kiki bunseki hoho to doko). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 10(9):1-3, Sept. 1974. 8 refs.*

The Agency of Industrial Science and Technology, Department of Equipment Standards has sponsored for the last 4 yr, with an annual budget of approximately $50,000, research on various types of continuous analysis equipment to be utilized by the Japanese Industrial Standards. The research had been conducted by the Industrial Pollution Control Association and various equipment manufacturers. This equipment includes continuous analyzers for sulfur oxides, carbon monoxide, nitrogen oxides, suspended particulates, stack gas SOx, hydrocarbons in the air, chlorine, oxidant, hydrogen fluoride, bad odors (hydrogen sulfide, ammonia), stack gas NOx, aldehydes, and hydrogen chloride. The first three have already been passed as JIS equipment, and the rest are under examination. Absorption spectrophotometry is widely used in Japan for single element measurement for its superior color selectivity. Electropotentiometry is used for NOx and CO. The ion electrode method is under consideration for JIS for its superior selectivity for specific ions. Among the dry methods, nondispersive infrared spectrometry is widely used; more recently, ultraviolet absorption spectrometry has been adopted for NOx analysis. The acidic rain that created physical effects this year for the first time in Japan has occurred in Europe since 1958, and acid generating substance was added as an air pollutant at the ISO Geneva Conference in 1972. The titration analyzer using a pH meter (developed in France) is widely used to measure acidity.

45818 **APTIC NO. 68687**

Yasue, Genichiro

MEASUREMENT METHODS FOR TOXIC GASES IN WORK ENVIRONMENT. *(Sagyo genba ni okeru yugai gasu sokuteiho ni tsuite). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 41(6):49-59, 1974. 9 refs.*

The physical characteristics of deleterious gases in the air, the units of their concentration, maximum allowable concentrations, the classification of analytical methods and pointers for measurement methods, the principles and methods of colorimetry detectors, handling care for detectors, various measurement elements (length, color, and volume), and examples of detector applications are discussed. The gas detector is the only dry method of analysis and comprises a gas detector tube, a gas sampler, and a concentration chart or a color shade chart, and a temperature adjustment chart. The ends of a detection tube are cut off by a diamond cutter and the tube is inserted into the sampler; the piston handle is drawn out in one motion and fixed at a 90 degree angle. The sampler is left in the desired location. After the gas enters the detector (up to 100 ml), the piston handle is turned at a right angle and the detection tube is taken out from the sampler and the color shade is checked against the chart. If the piston connection rubber tube is deteriorated, the gas will leak and the tube should be exchanged. When the piston handle is drawn and stabilized, it should be given 50 sec exactly and then the detector connection should be closed airtight and the piston handle should be released. If the sample measurement is 60-70 ml, it is normal, but if it is less than that, the suction speed adjuster hole may be clogged with dusts and the adjuster should be cleansed with some solvent. The adjuster is extremely small and should be handled with care.

45819 **APTIC NO. 68459**

Yatabe, Teruo

PROBLEMS IN MEASUREMENT TECHNIQUES FOR FLUE GASES: MEASUREMENT METHODS FOR SULFUR OXIDES AND NITROGEN OXIDES IN FLUE GASES. *(Endo haigasu ni okeru sokutei gijutsu no mondaiten: endo gasuchu no yuosankabutsu oyobi chisso sankabutsu no sokuteiho). Text in Japanese. Preprint, Japan Assoc. for Thermal Energy Technology, Tokyo (Japan), 13p., 1974. (Presented at the Heat Management Conference, Tokyo, Japan, June 24-27, 1974.)*

Various methods of measuring sulfur oxides and nitrogen oxides in flue gases are discussed and evaluated. Generally, there are the input system and the output system in measuring these elements, but the latter is more likely to be used in the future. The methods discussed for SOx are: iodimetric methods, flame photometric detector, coulometry, electroconductivity, the neutralization method, and infrared analysis. The NOx measurement methods discussed are: the phenol disulfonic acid method, the nitric acid ion electrode method, the zinc reduction naphthyl ethylene diamine method, the naphthyl ethylenediamine method, the Saltzman method, chemiluminescence, infrared or ultraviolet absorption, potentiometry, potentiometric electrolysis, oxidation, absorption, potentiometry, potentiometric electrolysis, oxidation, reduction, and output calculation methods.

45820 **APTIC NO. 68390**

Environmental Protection Service, Ottawa (Ontario), Air Pollution Control Directorate

STANDARD REFERENCE METHOD FOR THE MEASUREMENT OF SULPHUR DIOXIDE IN THE ATMOSPHERE (WEST-GAEKE METHOD). *Regulations, Codes and Protocols Rept. EPS 1-AP-72-4, 40p., July 1974. 14 refs.*

A method for measuring sulfur dioxide in ambient air is described which can measure 25-1050 micrograms/cu m SO2. It can measure concentrations below 25 micrograms/cu m by sampling larger volumes of air, but only if the absorption efficency of the particular system is first determined and is satisfactory. Higher concentrations can be analyzed by using smaller gas samples or a suitable aliquot of the collected sample. The SO2 is absorbed from air in a solution of potassium tetrachloromercurate. A dichlorosulfitomercurate complex, which resists oxidation by the oxygen in the air, is formed. Once formed, this complex is stable to strong oxidants such as ozone and oxides of nitrogen and therefore the absorber solution may be stored from some time prior to analysis. The complex reacts with pararosaniline and formaldehyde to form the intensely colored pararosaniline methylsulfonic acid. The absorbance of the solution is measured by a suitable spectrophotometer. The interferences, reagents, procedure, apparatus, sampling methods, calibration, and expression of results are described.

45821 **APTIC NO. 68421**

Environmental Protection Service, Ottawa (Ontario), Air Pollution Control Directorate

STANDARD REFERENCE METHOD FOR THE MEASUREMENT OF CARBON MONOXIDE IN THE ATMOSPHERE (NONDISPERSIVE INFRARED SPECTROMETRY). *Regulations, Codes and Protocols Rept. EPS 1-AP-73-1, 20p., July 1974.*

A nondispersive infrared method for determining carbon monoxide in ambient air and under pressure is described. Instruments are commercially available that measure in the range of 0-58 mg/cu m, which is the range most commonly used for the measurement of this pollutant in urban air. The interferences, procedure, reagents, apparatus, calibration, and expression of results of the method are described.

45822 **APTIC NO. 68453**

Pollution Measurement Equipment and Standard Research Committee, Japan

MAINTENCE STANDARDS FOR POLLUTION MEASUREMENT EQUIPMENT. *(Kogai keisokuki kanri kijun). Text in Japanese. Keiryo Kanri Keisoku Keiso (J. Instrum. Control Assoc. Japan), 23(9):418-422, Sept. 1974. 2 refs.*

Maintenance standards for pollution measurement equipment are described. The equipment must be placed where it can can be serviced and inspected with ease and safety, and the parts to be serviced must be readily accessible. The pollution equipment cannot be merely plugged into a sampling device and an electric circuit. The sample gas input tube, sample gas outgo tube, electrical source, signal cable, reagents, air purity for air-purging, moisture, and temperature fluctuations must all be considered in the placement and operation on the equipment. Whether the measuremnt operation is intermittent or continuous, operating conditions must be monitored periodically. Environmental factors affecting the measurement equipment must be moderated. These factors include: temperature (including effects of sunshine), moisture, rain and water leakage, wind, vibrations and shock, corrosion, dust, noise, electrical source, and safety of operation.

45823 **APTIC NO. 68854**

GCA Corp., Bedford, Mass., Technology Div.

GUIDELINES FOR AIR QUALITY MAINTENANCE PLANNING AND ANALYSIS. VOLUME 11: AIR QUALITY MONITORING AND DATA ANALYSIS. *Office of Air and Waste Management Contract 68-02-1478, Task 1, Program Element 2AH137, Rept. EPA-450/4-74-012, 113p., Sept. 1974. 10 refs.*

NTIS: PB 237626/AS

Planning information and preliminary guidance is given for the preparation and implementation of a monitoring system compatible with the goal of air quality maintenance and the need for the development of Air Quality Maintenance Plans. Background information is given on air quality maintenance planning processes, and current monitoring techniques. General guidelines are issued which are intended to provide a basic rationale for the development and evaluation of air monitoring networks. Topical areas covered include: network design; instrument siting; acceptable instrumentation; monitoring site description; air quality trend evaluation; air quality data evaluation; interpretation of air quality as it relates to national ambient air quality standards and procedures for validating, editing, and screening air quality data; and the quantity, type, temporal, and geographical distribution of air quality data necessary for establishing baseline air quality levels. (Author abstract modified)

45824 **APTIC NO. 68936**

Environmental Protection Agency, Research Triangle Park, N. C., Quality Assurance and Environmental Monitoring Lab.

GUIDELINES FOR DETERMINING PERFORMANCE CHARACTERISTICS OF AUTOMATED METHODS FOR MEASURING NITROGEN DIOXIDE AND HYDROCARBONS CORRECTED FOR METHANE IN AMBIENT AIR (FINAL REPORT). *Program Element 1HA327, Rept. EPA-650/4-74-018, 46p., Nov. 1974. 6 refs.*

NTIS: PB 238092/AS

Recommended performance specification and test procedures are given for range, noise, lower detectable limit, interference equivalent, zero drift, span drift, lag time, rise time, fall time, and precision for automated methods for measuring nitrogen dioxide and hydrocarbons corrected for methane. These specifications and test procedures are intended for use as guidelines to assist instrument manufacturers and instrument users to determine performance characteristics for continuous air monitoring analyzers. (Author abstract)

45825 **APTIC NO. 68953**

Pollution Measurement Equipment and Standard Research Committee, Japan

SOLUTION ELECTROCONDUCTIVITY SO2 METER FOR THE ENVIRONMENT. *(Yoeki dodenritsushiki SO2 kei (kankyoyo)). Text in Japanese. Keiryo Kanri Keisoku Keiso (J. Instrum. Control Assoc., Japan), 23(9):22-26, Sept. 1974.*

The electroconductivity method uses hydrogen peroxide-sulfuric acid solution as absorbent. Sulfur dioxide in air is absorbed and converted to sulfuric acid which changes the conductivity of the solution. The conductivity change is detected by a platinum electrode and transmitted to a recorder through an amplifier. An electroconductivity meter usually consists of a sampler, dust filter, flow meter, absorbing tube, mist trap, electromagnetic valve, and recorder. Appropriate maintenance is necessary for good performance. A short, clean Teflon or Pyrex tube less than 5 m long is desirable as the gas inlet tube for the sampler since adsorption of SO2 can be prevented. The gas inlet tube must be replaced after one year. A Teflon dust filter is recommended in order to eliminate errors caused by adsorption and reaction. Water used to prepare the absorbing solution must not have a conductivity higher than 1 microvolt/cm or a resistance lower than 1 megohm-cm.

1973

45826 APTIC NO. 68332

Aras, N. K., W. H. Zoller, G. E. Gordon, and G. J. Lutz

INSTRUMENTAL PHOTON ACTIVATION ANALYSIS OF ATMOSPHERIC PARTICULATE MATERIAL. *Anal. Chem., 45(8):1481-1490, July 1973. 20 refs.*

Concentrations of 14 elements in atmospheric particulate matter were measured by irradiation of the samples with bremsstrahlung from electrons of 35 MeV from the National Bureau of Standards electron linac and observation of gamma rays from the reaction products with germanium (lithium) detectors. The elements routinely observed by this nondestructive method were sodium, chlorine, calcium, titanium, chromium, nickel, zinc, arsenic, bromine, zirconium, antimony, iodine, cerium, and lead. Several other elements such as iron, selenium, rubidium, and yttrium were marginally observable. Although, in general, instrumental photon activation analysis (IPAA) is less sensitive than instrumental neutron activation analysis (INAA), with IPAA one can measure concentrations of several elements that are difficult or impossible to measure in urban particulates with INAA, especially Ti, Ni, As, I, and Pb. Measurements of Ni, As, and Pb are quite important because of their known toxicities. (Author abstract)

45827 APTIC NO. 68914

Bargues, Denis

HIGH-RESOLUTION INFRARED SPECTROMETRY APPLIED TO THE STUDY OF ATMOSPHERIC MINOR CONSTITUENTS OR POLLUTANTS. *(Spectrometrie infrarouge a haute resolution appliquee a l etude de constituants mineurs de l atmosphere et de polluants atmospheriques). Text in French. Paris Univ. (France), Thesis (Ph.D.), Nov. 12, 1973, 87p. 33 refs.*

Numerical treatment methods permitting a better understanding of recordings obtained with grille spectrometers are presented. Spectrometers with hyperbolic and sectional Newton s ring grilles were considered. The two mathematical methods developed aimed essentially at improving the precision of the line definition by numerical filtration and double derivation, and at an a posteriori improvement of the resolving power by numerical restitution of the frequencies not transmitted by the spectrometer (deconvolution method). Bands of ammonia measured at 10 micron, and other atmospheric spectra measured between 7 and 8 micron are analyzed.

45828 APTIC NO. 69105

Barnes, H. M., Jr., W. F. Herget, and R. Rollins

REMOTE SENSING OF SO2 IN POWER PLANT PLUMES USING ULTRAVIOLET ABSORPTION AND INFRARED EMISSION SPECTROSCOPY. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Chemistry and Physics Lab., 32p., 1973 (?). 3 refs.*

The remote sensing of sulfur dioxide in power plant plumes using ultraviolet absorption and infrared emission spectroscopy is described. Under the idealized conditions where atmospheric interference has been minimized and the plume temperature is known, a remote concentration measurement can be made with reasonable accuracy using dispersive spectroscopic techniques. For a practical measurement system, the atmospheric interference problem can be handled, but the temperature determination is a problem. The most accurate measurement of T subscript p requires a high spectral resolution (less than 0.5 cm to the minus 1 degree) and a computerized data reduction program. It may be possible to use nondispersive techniques, such as interference filters, to isolate certain spectral regions, but the temperature calculation still requires a computer. Laser scattering techniques are not particularly temperature sensitive, but the cost of laser systems appears prohibitive for routine monitoring at the present time. Gas-cell or gas-filter correlation spectroscopy appears to have the capability of making a single ended remote infrared measurement which is relatively insensitive to temperature. (Author summary modified)

45829 APTIC NO. 68349

Collis, R. T. H., W. Viezee, R. D. Hake, Jr., and P. B. Russell

LIDAR MEASUREMENTS OF THE VARIABILITY OF STRATOSPHERIC PARTICULATES. *Preprint, American Inst. of Aeronautics and Astronautics and American Meteorological Society, 9p., 1973. 7 refs. (Presented at the American Institute of Aeronautics and Astronautics/American Meteorological Society International Conference on Environmental Impact of Aerospace Operations in the High Atmosphere, Denver, Colo., June 11-13, 1973.)*

Periodic lidar observations of stratospheric aerosols over the period October 1972 to February 1973 were performed to provide information on the distribution of particulates in the natural (unperturbed) stratosphere as part of the Department of Transportation s Climatic Impact Assessment Program designed to estimate the impact of climatic changes resulting from perturbation of the stratosphere by the propulsion effluents of a world high-altitude aircraft fleet. Observed maximum values of total (aerosol plus molecular) backscatter were only 10-15% above the molecular backscatter. A multiple-layered structure was evident in the vertical aerosol distribution, and occasionally large monthly variations in location and thickness of these layers were observed between 20 and 30 km. The presence of a quasi-permanent aerosol scattering layer of 6 km thickness centered near 20 km is suggested. (Author abstract modified)

45830 APTIC NO. 69154

Georgii, H. W., D. Jost, and W. J. Mueller

TRIAL OF A METHOD OF MEASURING AMMONIUM AND AMMONIA CONCENTRATIONS IN THE PPB RANGE. *(Erprobung eines Verfahrens zur Messung von Ammonium und Ammoniak im ppb-Bereich). Text in German. Ber. Inst. Meteorol. Geophys. Univ. Frankfurt Main), no. 25, 29p., May 1973. 21 refs.*

NTIS: N74 22068

The indophenol blue reaction, with the aid of an automatic analyzer, can be used to analyze atmospheric air samples for ammonium and ammonia concentrations in the ppb range. The method offers improved reagent stability and shorter sample time as compared with standard method of analysis for ammonium (Nessler s Analysis). Concentrations of sulfur dioxide in the 500 micrograms/ml range and hydrogen sulfide levels of 1 microgram/ml produce only small interference with the analysis. Ammonium aerosols can be measured by placing a Sartorius-PVC membrane filter of 0.45 micron pore size in front of the wash flask.

45831 APTIC NO. 69155

Georgii, H. W., W. Grosch, and D. Jost

OPERATIONAL TEST AND USES OF A CONTINUOUS MEASURING SYSTEM FOR NITROGEN OXIDES IN THE PPB RANGE. *(Funktionspruefung und Einsatzmoeglichkeiten eines kontinuierlichen Messsystems fuer nitrose Gase im ppb-Bereich). Text in German. Ber. Inst. Meteorol. Geophys. Univ. Frankurt Main, no. 26, 109p., Aug. 1973. 38 refs.*

NTIS: N74 22069

A amperometric method for the monitoring of nitrogen oxides in the ppb range is described. The time constants of the system are dependent on the concentration level, and the maximum range of scale can be changed within a ratio of 1:100. The system s high sensitivity (10 ppb) permits measurements at background level, though the high time constant at the instrument s maximum sensitivity range restricts measurements to certain conditions. The system can be used for monitoring from airplanes and the pressure on it can be eliminated by theoretical correction. The system also requires little maintenance. Oxidation of nitric oxide is the major problem encountered, with the oxidation rate being a function of the humidity of the measured gas. Changes in temperature can also affect the accuracy of measurement.

45832 **APTIC NO. 68335**

Grossman, J. J., H. G. Gross, and H. A. Hyatt

STUDY OF LASER REMOTE SENSING TECHNIQUES FROM SPACE PLATFORMS. *Preprint, McDonnell-Douglas Astronautics Co., West Huntington Beach, Calif., p. 373-394. 1973. 23 refs.*

The active remote sensing of the Earth s environment using satellite platforms is reviewed. Various types of lasers can be used as sources for monitoring global and local aerosol and gas profiles at low concentrations in the trophosphere and stratosphere. Subsequent spectroscopic analysis of the photoluminescence, resonance fluorescence, and Raman scattering return signal is considered for the various atmospheric, oceanic, and continental domains. Different lidar transmitter and receiver geometries (monostatic and bistatic) are given in order to compare the best approach to detection of particular species by optimizing the signal-to-noise ratio. The effects of background noise radiation in detecting low concentrations of materials and the expected signal-to-noise ratio in different spectral regions depending on global or local targets, transmitter-sensor positions, latitude, season, and time of day are discussed. Several factors indicate that the differential absorption technique is the most sensitive and practical method of sensing gaseous air pollutants over the great distance between the troposphere and a lidar system aboard artificial satellites. (Author abstract modified)

45833 **APTIC NO. 68319**

Hara, Noboru

THE SIMPLE DETERMINATION OF LEAD IN AIR USING THIN LAYER CHROMATOGRAPHIC PLATE. *Ind. Health, 11(3):155-157, 1973. 1 ref.*

A method to capture lead dusts on paper and to determine the lead concentration by coloring it on the paper was modified to overcome problems caused by soot or other contaminants. First the lead captured on the filter paper is dissolved in the buffer solution. Then the solution is developed along the glass plate using the method of thin-layer chromatography, and the lead in the solution is absorbed on the plate. Lead is colored on the plate and is determined by comparing the deepness of the color. The apparatus, reagents, procedure, and results of this method are discussed.

45834 **APTIC NO. 68641**

Hersch, Paul Andre

ELECTROCHEMICAL CARBON MONOXIDE MEASUREMENT. *(Verwendung einer Anordnung zur Bestimmung einer oxydierenden Gaskomponente zur Bestimmung von Kohlenmonoxid in einem Gasgemisch). Text in German. (Beckman Instruments, Inc., Fullerton, Calif.) W. Ger. Pat. Appl. 1,498,598. 3p., May 24, 1973. 1 ref. (1 claim).*

To determine carbon monoxide content, an apparatus is used to detect a gas component which releases halogen by oxidation in an aqueous halide electrolyte, e.g., ozone. The apparatus comprises a galvanic, cathodic reduction cell in which a closed electrolyte circuit has two branches, one into which the gas mixture being tested is fed and adsorbed, and the other in which are disposed the cathode and active carbon anode. In the gas feed pipe leading to the first branch is a conversion chamber containing iodine pentoxide from which iodine vapor is released under the action of CO.

45835 **APTIC NO. 69140**

Holleck, G. L., J. L. Bradspies, S. B. Brummer, and L. L. Nelsen

CARBON MONOXIDE DETECTOR (FINAL REPORT). *Tyco Labs., Inc., Waltham, Mass., National Aeronautics and Space Administration Contract NAS8-29031, 68p., Dec. 1973. 4 refs.*

NTIS: N74-20012

The development of an electrochemical sensor for the continuous monitoring of ppm levels of carbon monoxide in air is described. The device is based on the electrochemical oxidation of CO in a fuel cell type detector. The presence of air limits the potential of operation to between approximately 1.0-1.4 volts versus a reference hydrogen electrode. The CO oxidation current on Teflon-bonded platinum electrodes is practically independent of the potential within this range when phosphoric acid is used as the electrolyte. The current, however, is not diffusion controlled and decays with time due to a slow increase and/or rearrangement of the oxide on the electrode surface and a slow accumulation of a side-reaction intermediate which acts as an electrode poison. The temperature-dependence of the CO oxidation follows an Arrhenius equation with an activation energy of 6.5 kcal/mole. The oxidation of CO in a sulfuric acid electrolyte results in a higher current than with H3PO4, with the current being dependent on the potential. A stable detection current is obtained in the lower potential region (approximately 1 volt versus the reference hydrogen electrode). The signal declines at higher potentials. The activation energy of the CO oxidation in H2SO4 is 4 kcal/mole at 1.2 volts and 2.6 kcal/mole at 1.0 volts versus the RHE. The CO oxidation current is fairly insensitive to variation in electrolyte concentration, although the electrolyte level and thus humidity of the gas sample must be controlled to prevent drying or flooding of the electrode. A special cell design for tolerating appreciable humidity variations was developed along with a complete CO monitoring system which uses a palladium reference electrode for controlling potential.

45836 **APTIC NO. 68334**

Kometani, T. Y., J. L. Bove, and B. Nathanson

PAPER FIBER FILTERS FOR SAMPLING TRACE METALS IN AIRBORNE PARTICULATE MATTER. *Am. Soc. Testing Mater. Spec. Tech. Publ., no. 540:123-131, 1973. 11 refs.*

The advantages of paper filters over fiberglass filters for sampling and analyzing airborne particulate trace metals by atomic absorption spectrometry are presented along with comparative analytical results obtained from dry ashing, wet ashing, and low temperature ashing of New York City particulates. The use of paper filters overcomes problems associated with fiberglass filters involving glass metal impurities and tedious acid extraction procedures necessary to recover metals from particulates. Samples on paper filters can be dry ashed to 500 C without serious loss of metals by volatilization. The filter is completely destroyed leaving only inorganic residue to be dissolved for analysis by atomic absorption spectrometry. Although chlorides of lead, cadmium, and zinc are volatile at 500 C, they can be stabilized by treatment with sulfuric acid prior to ashing. Recovery experiments with fiberglass filters at 500 C show that dry ashing lead, copper, cadmium, and zinc salts on glass filters results in serious loss of metals by retention to the glass surface. Analyses of New York City particulates collected on paper filters obtained by dry ashing compare favorably with those of accepted methods such as wet ashing and low temperature ashing. (Author abstract modified)

45837 **APTIC NO. 68317**

Kretzschmar, J. G.

A FAST AND ACCURATE GRAPHICAL MEANS TO DETERMINE THE PRECISION OF SAMPLING PLANTS FOR LOG-NORMALLY DISTRIBUTED AIR POLLUTANTS. *Sci. Total Environ., vol. 2:213-221, 1973. 3 refs.*

A graphical method is presented for the determination of the confidence interval for the exact 50th percentile as a function of the sampling plan and the geometric standard deviation. The method is based on the assumption that the data are log-normally distributed. Charts can be constructed from some basic equations to allow an easy, fast, and accurate determination of the confidence intervals of the geometric mean. The major advantage of using charts is that the comparison between different sampling plans is easy for any combination of parameters, even for workers without statistical experience. (Author summary modified)

45838 **APTIC NO. 68327**

Lao, R. C., H. Oja, R. S. Thomas, and J. L. Monkman

ASSESSMENT OF ENVIRONMENTAL PROBLEMS USING THE COMBINATION OF GAS CHROMATOGRAPHY AND QUADRUPOLE MASS SPECTROMETRY. *Sci. Total Environ., vol. 2:223-233, 1973. 6 refs.*

A computerized gas chromatographic-mass spectrometric (GC-MS) system was applied to the analysis of the aromatic hydrocarbon fraction of organic extracts of environmental samples. The quadrupole mass spectrometer functions as a highly sensitive GC detector which measures both the molecular weight and the concentration of the chromatographic effluent. Under complete computer control, the system collects mass spectra, total ions, and GC data and performs the necessary data reductions. A number of complex environmental samples are discussed with emphasis on the benzopyrene family of isomers, some of which are carcinogenic. With the availability of spectrum background substraction, a number of new compounds were identified and measured in air samples. The enhancement of GC resolution and shortened sample analysis times through computer operations are discussed. A projected basis for routine analysis of polycyclic aromatic hydrocarbons in ambient environmental air samples is delineated. (Author summary)

45839 **APTIC NO. 68465**

Lepsi, Pavel

A SIMPLE CHEMICAL METHOD FOR DETERMINATION OF ETHYLENEGLYCOL IN THE ATMOSPHERE. *(Jednoducha chemicka metoda na stanoveni etylenglykolu v ovzdusi). Text in Czech. Pracovni Lekar (Prague), 25(8):330-333, 1973. 11 refs.*

A polarographic method for the determination of atmospheric ethylene glycol is described. The method is based on the oxidation of ethylene glycol with periodic acid in a medium of dilute sulfuric acid. Formaldehyde formed by the oxidation is polarograhically determined in a lithium hydroxide medium; excess periodic acid is simultaneously removed. Determinations can be performed within the concentration range of 0-200 micrograms of ethylene glycol per 10 ml of measured solution. The atmospheric samples are collectdd by standard frit absorbers, with distilled water being used as the absorption solution.

45840 **APTIC NO. 68909**

Mammarella, Luigi

AIR POLLUTION DUE TO LEAD FROM MOTOR VEHICLES. *(L inquinamento atmosferico da piombo di origine autoveicolare). Text in Italian. Rass. Chim., 25(4):301-305, July-Aug. 1973. 10 refs.*

A simple, reproducible routine method for the granulometric analysis of lead aerosols emitted by motor vehicles is described. The air to be analyzed is sampled at a rate of 25 l/min through a new 4-stage differential sampler with particle size limits of 10, 6-7, 4 and 2 micron. The sample collected is directly analyzed by a light microscope under polarized light. Most lead particles were in the below-2-micron fraction, and of spheroid shape.

45841 **APTIC NO. 68696**

Nishiyama, Keitaro, Hitoshi Yano, and Michinobu Kono

THE PCB MEASUREMENT METHODS IN THE AIR AND THE GASIFICATION RATE OF PCB FROM SENSITIZED PAPER. *(Kukichu no PCB sokuteiho to kanatsushi kara no kika). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 28(1):81, April 1973.*

The method of measuring airborne polychlorinated biphenyls (PCB), the rate of PCB gasification from PCB containing sensitized paper, and the air of rooms containing such paper were examined. The PCB collection device comprised three dehydration glass tubes and a glass column packed with 60-80 mesh simalite (6 g) contained in a cooling tank. One cooling tank had ice and salt, the other, ice and acetone. Sample air was passed at the rate of 5 l/min, about 1 cu m each. The column content was then extracted by 100 ml of n-hexane, and the water, n-hexane, and clean up silica gel were all condensed and applied to ECD gas chromatography. The samples agreed well with the gas chromatogram pattern of the standard material. Gasification of PCB was studied by hanging 50 pairs of sensitized paper in a desiccator and by changing the temperature. The gasification suddenly increased when the temperature rose above 20 C, but the rate depended on the elements. The room air PCB content was examined by sampling the air of rooms storing 600,000 sheets of sensitized paper, and of various rooms where such paper was handled. While the control room had no PCB particles at all, the room where the paper was stored and handled had between 10 to 21.1 micrograms/cu m of PCB. A considerable amount of PCB was gasified and freed from sensitized paper, and the rate of gasification increased with the rise of the room temperature.

45842 **APTIC NO. 68482**

Oiwa, Tadahiro, Takashi Mimura, Toshio Sakamoto,
Tomonobu Sato, and Shigeharu Matsumoto

AUTOMATIC POLLUTION MONITORING SYSTEMS. *(Kankyo osen kanshi shisutemu ni tsuite). Text in Japanese. Nihon Musen Giho (JRC Rev.), no. 7:96-110, 1973. 5 refs.*

Automatic environmental monitoring systems are described for the detection of air pollution and water pollution. Both systems detect, sample, and measure pollution at remote monitoring stations located in critical areas and then transmit the local data to the monitoring center station via telephone or ultra-high frequency communication channels at rates between 50 and 200 bits/sec. The data from the remote sensors are automatically processed and displayed by the use of a 24 bit per word computer at the monitoring center. A unique feature of the pollution monitoring systems is the multicolor video cathode ray tube data display built into the operator s system control console at the monitoring center. The display allows simple instructional operations of the entire system and permits immediate access of pollution data (current and historical) which are stored in the mass data storage devices of the computer. The multicolor display and the system console provide a convenient and effective interface between the system operator and the system-related software.

45843 **APTIC NO. 70832**

Peregud, Y. A. and Y. V. Gernet

CHEMICAL ANALYSIS OF THE AIR OF INDUSTRIAL ENTERPRISES. *(Khimicheskiy analiz vozdykha promyshlennykh predpriyatiy). 3rd ed., rev., Leningrad, Khimiya Press, 1973, 440p. 176 refs. Translated from Russian. 798p., Nov. 19, 1973.*

Methods for the sampling and chemical analysis of over 225 specific industrial chemicals are presented. Special attention is given to determination of harmful substances for which permissible concentrations in the air of industrial areas have been established. The substances include these groups: gasoline and white spirit vapors; chlorinated hydrocarbons; fluorinated hydrocarbons; organic phosphorus insecticides; aliphatic amines; aromatic amines; organic acids and their derivatives: anhydrides, amides, and nitriles; alcohols and phenols; simple and complex esters; aldehydes, ketones, and quinones; heterocyclic compounds; organic acids and peroxides; organic sulfur compounds; organic silicon compounds; metals and organometallics; and gases and aerosols. Appendices are included on the maximum permissible concentrations of harmful gases, vapors, and aerosols in work areas and in populated areas, and a table of factors for reducing air volume to standard conditions.

45844 APTIC NO. 68580

Schaller, E. S.

ENVIRONMENTAL OBSERVATIONS FROM SPACE - THE PROMISE AND THE CHALLENGE. *Society of Engineering Science, Proc. Int. Meet., Pollut. Eng. Sci. Solutions, Proc. Int. Meet. Soc. Eng. Sci., 1st, Tel Aviv, Israel, 1972, p. 70-76, 1973. (June 12-17.)*

The application of space technology to remote sensing of the earth s environment is discussed with particular emphasis on the Earth Resources Technology Satellite. The ERTS program consists of the ERTS observatory, an ERTS ground data handling system and over 200 investigators on an international level. The ERTS observatory acquires high resolution multispectral images of the earth s surface on a repetitive, global basis by carrying a three camera return beam vidicon system and a four-channel multispectral scanner system. The cameras are fitted with filters for operation in the red, green, and infrared bands of the light spectrum. The multispectral scanner gathers data by imaging the earth scene below in several spectral bands simultaneously, through the same optical system. The data collection system operates in conjunction with small, remote, automatic data collection platforms which are instrumented and deployed on the ground by individual investigators. The ERTS system is capable of surveying more than 42 million sq km each week, covering the same scene 20 times a year, for the monitoring of critical environmental parameters such as gaseous and particulate air pollutants.

45845 APTIC NO. 68828

White, Kenneth O. and Gerald T. Wade

REMOTE SENSING OF ATMOSPHERIC METHANE USING AN ERBIUM/YAG LASER: A FEASIBILITY STUDY. *Army Electronics Command, White Sands Missile Range, N. Mex., Atmospheric Sciences Lab., DA Task 1T061102B53A-19, Rept. ECOM-5517, 19p., Nov. 1973. 13 refs.*

NTIS, DDC: AD 769732

The feasibility of a remote sensing scheme for the detection of methane is being studied based on a coincidence between the emission of the erbium/YAG laser and a methane absorption line occurring at 1644.9 nm. Two remote sensing techniques are being considered: the differential absorption transmission method and the differential absorption lidar technique. The research program consists of an experimental part to determine the spectral line parameters and a theoretical part to determine the performance that could be expected from a remote sensing system. Results of calculations, using the best available data, are presented which were made to determine the performance that could be expected with the two techniques. The results indicate that both techniques are feasible with actual performance determined by the atmospheric visibility conditions and the exact value of the absorption coefficient of the methane absorption line. However, the ranges available using the lidar technique are limited to 4 km or less. (Author abstract)

45846 APTIC NO. 68310

Environmental Protection Service, Ottawa (Ontario), Air Pollution Control Directorate

STANDARD REFERENCE METHOD FOR THE MEASUREMENT OF OXIDANTS (OZONE) IN THE ATMOSPHERE (CHEMILUMINESCENCE METHOD) (FINAL REPORT). *Rept. EPS 1-AP-73-7, 32p., Nov. 1973. 11 refs.*

A standard reference method for the continuous determination of ozone concentrations normally found in ambient air is described. The ozone determination method is based on the gas-phase chemiluminescence from the reaction of ozone with ethylene which produces light emission in the visible region (maximum at 440 nm). The light is detected by a photomultiplier tube and the resulting current is amplified and displayed. Calibration is carried out using an ozone source that has been standardized by means of the neutral potassium iodide method. The method s range is from 3.9 to more than 1962 micrograms of ozone/cu m air, with a minimum detectable concentration of 0.002 ppm ozone. Other oxidizing and reducing species such as peroxyacetyl nitrate, hydrogen peroxide, nitrogen dioxide, and sulfur dioxide that may be present in air do not interfere with the ozone determination. The standard deviation of repeated single measurements should not exceed 2% of the mean of the measurements at 1570 micrograms of ozone/cu m air.

45847 APTIC NO. 68389

Environmental Protection Service, Ottawa (Ontario), Air Pollution Control Directorate

STANDARD REFERENCE METHOD FOR THE MEASUREMENT OF SUSPENDED PARTICULATES IN THE ATMOSPHERE (HIGH VOLUME METHOD). *Regulations, Codes and Protocols Rept. EPS 1-AP-73-2, 46p., Jan. 1973. 6 refs.*

The high-volume sampling method for measuring airborne suspended particulates over designated time intervals is discussed. When the sampler is operated at an average flow rate of 1.7 cu m/min for 24 hr, an adequate sample will be obtained even in an atmosphere having concentrations of suspended particulates as low as 1 microgram/cu m. If particulate levels are unusually high, a satisfactory sample may be obtained in 6-8 hr or less. For determination of the mean concentrations of suspended particulates in the ambient air, a standard sampling period of 24 hr is recommended. The interferences, reagents, apparatus, sampling and samples, procedure, calibration, and expression of results of the method are reviewed.

45848 APTIC NO. 68393

Environmental Protection Service, Ottawa (Ontario), Air Pollution Control Directorate

STANDARD REFERENCE METHOD FOR THE MEASURMENT OF OXIDANTS (OZONE) IN THE ATMOSPHERE (CHEMILUMINESCENCE METHOD). *Regulations, Codes and Protocols Rept. EPS 1-AP-73-7, 34p., Nov. 1973. 11 refs.*

A chemiluminescent method to measure ozone concentrations in ambient air is described which represents a change in the applicable test method. The determination of O3 is based on the gas-phase chemiluminescence from the reaction of O3 with ethylene, which produces light emission in the visible region (maximum at 440 nm). The light is detected by a photomultiplier tube and the resulting current is amplified and displayed. Calibration is carried out using an O3 source that has been standardized by means of the neutral potassium iodide method. The sensitivity range is from 3.9 to 1962 micrograms O3/cu m. The minimum detectable concentration is 3.9 micrograms O3/cu m (0.002 ppm). The standard deviation of repeated single measurements should not exceed 2% of the mean of the measurements at 1570 micrograms O3/cu m. The accuracy of the reference method is limited by the method of calibration. With potassium iodide calibration, the accuracy is + or - 7%.

1972

45849 **APTIC NO. 68325**

Fulwiler, R. D., J. C. Abbott, and F. J. Darcy

EVALUATION OF DETERGENT ENZYMES IN AIR. *Am. Ind. Hyg. Assoc. J., 33(4):231-236, April 1972. 14 refs.*

To assist in evaluation of the physiological aspects of exposure to detergent enzymes and the adequacy of industrial hygiene controls, a method for determining air concentrations of proteolytic enzymes was developed. Samples were taken by means of a high-volume sampling technique in which the dust was collected on glass fiber pads. The total dust level was determined gravimetrically; the amount of proteolytic enzyme was determined colorimetrically with dimethylated casein as the substrate and trinitrobenzene sulfonic acid as the color reagent. Data describing analytical accuracy, precision, and detection limits are presented. Results over a 16-month period for key operating areas in several detergent plants indicated a reduction in total dust and enzyme levels and a satisfactory position in terms of the threshold limit value. An automated data handling system which serves individual plant and corporate needs is described. (Author abstract modified)

45850 **APTIC NO. 65788**

Martin, A. and C. Elejalde

DETERMINATION OF RHENIUM IN SOOT BY NEUTRON ACTIVATION ANALYSIS. *(Determinacion de renio en hollines por activacion neutronica). Text in Spanish. Anales Quim., 68(11):1237-1240, 1972. 3 refs.*

An analytical method for the quantitative determination of the rhenium content in brown coal soot by neutron activation analysis is described. Rhenium is extracted from the soot samples previously irradiated for 4 to 5 hr by digestion with concentrated nitric acid. Another method involves sintering the soot with dead lime, heating at 550-600 C, followed by extraction with dilute hydrochloric acid. The extracts are purified by means of ion exchange resins for immediate measurement of the gamma activity of the 0.14 MeV and 0.16 MeV peaks of the (186)Re and (188)Re isotopes. The sensitivity of the method amounts to 0.01 ppm.

45851 **APTIC NO. 68409**

Scott Research Labs., Inc., San Bernardino, Calif.

A STUDY OF MANDATORY ENGINE MAINTENANCE FOR REDUCING VEHICLE EXHAUST EMISSIONS. VOLUME VI. A COMPARISON OF OXIDES OF NITROGEN MEASUREMENTS MADE WITH CHEMILUMINESCENT AND NON- DISPERSIVE RADIATION ANALYZERS (YEAR END REPORT). *Coordinating Research Council, Inc. and Environmental Protection Agency Contract, APRAC Proj. CAPE-13-68, Rept. EPA-460/3-74-010-f, 31p., July 1972.*

NTIS: PB 220731

Comparisons of nitrogen oxide measurements using chemiluminescence versus non-dispersive infrared/ultraviolet techniques are reported as part of a program designed to study the effect of mandatory engine maintenance on reducing vehicle exhaust emissions. High precision is obtained for NOx measurements made with identical chemiluminescence instruments. Nitrogen oxide values measured by NDIR/NDUV techniques (with Drierite placed in the sample handling system of the NDIR) are significantly larger than those of corresponding chemiluminescent determinations due to the effect of Drierite in the NDIR sample handling system and the response of the NDIR to interference gases found in dilute samples of automotive exhaust gas. The action of Drierite on the sample gas is such that nitrogen dioxide concentrations are decreased while nitric oxide concentrations are increased; this conversion of NO2 to NO is only a partial one, and thus a net decrease in NOx concentration results.

1971

45852 **APTIC NO. 68362**

Corte, G. and J. L. Monkman

THE COLLECTION AND MEASUREMENT OF AIRBORNE MERCURY-I. *Environmental Protection Service, Ottawa (Ontario), Chemistry Div., APCD 71-8, 39p., Sept. 10, 1971.*

Measurement of inorganic and organic mercury on silver elements was studied. The method did not involve any liquid reagents, and the collection seemed to be quantitative. The mercury, after collection, was desorbed from the silver collection by heat, and the mercury vapor evolved was passed into a measuring cell for measurement of the ultraviolet absorption. The measuring instrument was a Du Pont 400 photometric analyzer. Calibration experiments were carried out. With elemental mercury, the capacity of the sampler was 100 nanograms of mercury. After initial electronic faults were corrected, the Du Pont 400 Analyzer performed satisfactorily with 0.3 nanograms of mercury sensitivity per determination. The overall assembly was somewhat inflexible inasmuch as no more than 10 nanograms could be measured per determination. As a result, a considerable number of air samples may be off the scale of the instrument. Several air sampling mechanisms are suggested for obtaining samples within the present sensitivity range. (Author abstract modified)

45853 **APTIC NO. 68363**

Corte, G. and J. L. Monkman

THE COLLECTION AND MEASUREMENT OF AIRBORNE MERCURY-II. *Environmental Protection Service, Ottawa (Ontario), Chemistry Div., APCD 71-12, 48p., Sept. 17, 1971.*

Some experience with the Casella personal sampler and the silver absorber for measuring airborne mercury is discussed. The collection efficiency of the silver absorber for metallic mercury is close to 100%. A recommended sampling procedure using the Casella sampler is suggested. A limited survey of mercury levels in air was made, from which it appeared that ambient air background levels with the analytical method used can be as low as 5 nanograms/cu m of air. The measurement of mercury in air levels is being continued in order to accumulate as much background data as possible. The sensitivity of the sampler was better than 0.3 nanograms of elemental mercury. (Author abstract modified)

45854 **APTIC NO. 68364**

Corte, G., R. C. Lao, L. Dubois, R. S. Thomas, and J. L. Monkman

COLLECTION AND MEASUREMENT OF AIRBORNE MERCURY. III. *Environmental Protection Service, Ottawa (Ontario), Chemistry Div., APCD 71-14, 48p., Dec. 14, 1971. 6 refs.*

Extensive experiments were conducted in the duplicate sampling and analysis of airborne mercury using silver elements. For probably the first time in such a field method, a degree of quality control was built into the sampling and analytical routine. The method is simple, easily performed, and of value in the field as a calibration or reference method against which the response of semi-continuous or continuous instruments such as the Geomet or Scintrex can be assessed. Considerable effort was spent on the evaluation of portable personal samplers. A statistical rating was determined of the precision of a series of duplicate experiments on two identical samplers. The statistical norm was used to provide quality control. Preliminary experiments carried out with several organic mercury compounds suggested that it may be possible to sample the materials on silver elements either as the organic vapor or as the mercury component of the compound. (Author conclusions modified)

45855 **APTIC NO. 68638**

Gribovskaya, I. F., L. R. Nozdryukhina, N. T. Larchenko, A. V. Karyakin, and M. M. Farafonov

QUANTITATIVE SPECTRAL ANALYSIS OF MANGANESE, NICKEL, COPPER, CHROMIUM, IRON, BARIUM, STRONTIUM, VANADIUM, AND LEAD IN THE BLOOD BY MEANS OF QUANTOMETER. *(Kolichestvennoye spektral noye opredeleniye margantsa, nikelya, medi, khroma, zheleza, bariya, strontsiya, vanadiya i svintsa v krovy na kvantometre). Text in Russian. Nauch. Dokl. Vyssh. Shk. Biol. Nauki, no. 9:121-127, 1971. 15 refs.*

A method for the quantitative spectral analysis of blood samples for manganese, nickel, copper, chromium, iron, barium, strontium, vanadium, and lead is described. After drying, the blood samples were incinerated by dry method at 450-470 C, and the residual ash was transferred between two electrodes for spectral analysis. Synthetic reference samples, and the wavelengths of 3414.8 A, 2599.4 A, 4934.1 A, 2949.2 A, 4607.2 A, 4379.2 A, 4254.4 A, 3274.0 A, and 2833.1 A were used for the analysis of nickel, iron, barium, manganese, strontium, vanadium, chromium, copper, and lead, respectively. The relative square value of the error ranged from 10 to 25% depending on the specific element. When averaging, samples in which element is present in a concentration below the detection limit should be taken into account. In such cases, the average can be calculated by taking the limit of detection for the samples in which the specific element was not detectable.

45856 **APTIC NO. 69110**

Oikawa, Kikuo, Yasuji Himi, Fumio Muramatsu, Tatsuo Tanaka, and Ryoichiro Ogawa

THE PROPERTIES OF TUBE FILTERS FOR ANALYZING METALS IN FLUE GASES: METAL COMPOSITIONS IN VARIOUS TUBE FILTER PAPERS. *(Endo haigasu-chu kinzoku seibun bensekiyo ento roshi no tokusei daiippo: kakushu ento roshi no kinzoku seibun ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), no. 6:78, 1971.*

For the measurement of cadmium and lead in flue gas by a sampling probe, a filter paper with very little metal impurities is desirable. Various types of filter papers were prepared and the metal content and mechanical properties were examined. The filter papers were made with glass, silica, and cellulose fibers in three sizes: diameters 20, 25, and 28 mm. Cellulose was the chemical analysis material and was not given any pretreatment. For the glass fiber paper, borosilicic acid glass fiber of less than 1 micron was crushed in a beater, soaked in dilute hydrochloric acid for 24 hours to dissolve all the metal content, and washed in pure water completely. Silica glass fiber was prepared similarly. The metal composition of each filter paper was examined by atomic absorption spectrophotometry. The levels of lead, cadmium, chromium, manganese, zinc, copper, nickel, cobalt, and iron were measured and found satisfactorily low, though they were somewhat higher in the silica fiber paper. The physical properties of weight, thickness, permeability, tensil strength, breakage strength are presented in a table. The cellulose filter seemed to be particularly strong and had few impurities.

45857 **APTIC NO. 68316**

Szczepaniak, W. and W. Walkowski

DETERMINATION OF NICOTINE IN AIR BY THE RING OVEN TECHNIQUE. *(Oznaczanie nikotyny w powietrzu metoda pieca pierscieniowego). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 5(1):48-52, 1971. 5 refs.*

NTIS: TT72-54022/1

The ring oven technique for determining nicotine in the air is described. Silica gel is used as the nicotine-absorbing agent. After the nicotine adsorbate is extracted from the gel with toluene, nicotine is determined in a ring oven. The error inherent in the method does not exceed 10%. The method was used to measure nicotine in the air of a tobacco cutting room. Nicotine concentrations measured were 0.00032, 0.00032, 0.00042, 0.00058, 0.00072, and 0.00030 mg/l.

1970

45858 **APTIC NO. 59851**

Deepak, A. and A. E. S. Green

SECOND AND HIGHER ORDER SCATTERING OF LIGHT IN A SETTLING POLYDISPERSE AEROSOL. *Appl. Opt., 9(10):2362-2371, Oct. 1970. 16 refs.*

The experimental-cum-theoretical investigation reported here explains a simple, practical, and efficient experimental method and its appropriate theory for measuring the size distribution n(r) of particles in a settling polydisperse aerosol. Conditions of optical thickness such that the multiple light scattering (MS) contribution cannot be neglected as compared to the single scattering contribution are used. The basis of the experimental technique is the measurement of the radiance due to multiple light scattering alone; and the basis of the theoretical approach is to treat MS radiance as the sum of contributions due to the various orders of scattering from the second order up, and that the Nth order scattering is the result of N single scatterings. Below a certain value of optical thickness (approximately 1.5) the contributions due to the second and third orders of scattering suffice to explain the observed data for the MS radiance. For higher values of optical thickness, the computation higher orders of scattering is needed. A semiempirical expression which can accurately fit the observed data is given. The technique can be adapted for the determination of the particle size distribution of natural aerosols in a planetary atmosphere. (Author abstract)

1969

45859 **APTIC NO. 68573**

Lvov, B. V. and A. D. Khartsyzov

ATOMIC ABSORPTION ANALYSIS OF SULFUR, PHOSPHORUS, IODINE, AND MERCURY ON THE RESONANCE LINES IN THE VACUUM UV SPECTRAL RANGE. *(Atomno-absorptsionnoye opredeleniye sery, fosfora, yoda i rtuti po rezonansynm liniyam v vakuummoy ul trafioletovoy oblasti spektra). Text in Russian. Zh. Prikl. Spektrii., no. 11:413-416, 1969. 5 refs.*

An improved method for the atomic absorption analysis of trace quantities of sulfur, phosphorus, iodine, and mercury on the resonance line in the vacuum UV range is described. The elements are determined in the form of an absorbing layer of vapors in a graphite cuvette, and high-sensitivity monochromator is used for the recording. Mercury was analyzed at 700 C cuvette temperature at the 1849 A line, while a cuvette temperature of 1200 C and a line at 1830 A are best for the determination of iodine. Phosphorus was analyzed at a cuvette temperature of 1400 C at 1775 A. A cuvette temperature of 1400 C and a spectral line at 1807 A were used for sulfur. The sensitivity, expressed as optic density per gram, amounted to 7,000,000,000 for mercury; 1,300,000,000 for phosphorus; 120,000,000 for iodine, and 54,000,000 for sulfur.

45860 **APTIC NO. 68426**

Sukumaran, K. V.

STUDY OF FILTER MEDIA FOR AIR-SAMPLING PURPOSES. *In: Radiation Protection Monitoring, p. 243-251, 1969. 3 refs.*

A comparative study was carried out for filter media commonly used in monitoring airborne radioactivity. The following characteristics were studied: filtration efficiency for uranyl nitrate aerosol and natural activity; pressure drop at various flow rates; absorption factor for alpha particles; use for alpha pulse-height analysis; and physical properties such as tensile strength, thickness, density, and ash content. From the results, the order of preference for use in routine monitoring was CWS-6, HV-70, AGF/F, AGF/A, Whatman-41, and Whatman-42. All filters except W-41 showed an efficiency above 99% against uranyl nitrate aerosols. Against short-lived natural radioactivity when the particles were known to be in the submicron range, none showed an efficiency of more than 90%. The W-41 and W-42 were the least preferred from the efficiency point of view. While membrane filters provide the best collection media, their comparatively high cost, high resistance to air flow, and brittleness limit their usefulness. Glass fiber filters show less pressure drop, higher detection efficiency, and better resolution for alpha spectra under identical conditions than do cellulose or cellulose asbestos filters. They are extremely fragile and cannot be recommended for use at high face velocities. High dust loading and large size radioactive particles severely affect the shape of the alpha spectrum and hence restrict the identication of the isotopes. Filter samples obtained at working places can be subjected to routine alpha spectrometry, provided the radiation energies of the isotopes do not lie too close together. (Author abstract modified)

1954

45861 **APTIC NO. 68777**

Beck, Lloyd Henry, Lawrence Kruger, and Paul Calabresi

OBSERVATIONS ON OLFACTORY INTENSITY. I. TRAINING PROCEDURE, METHODS, AND DATA FOR TWO ALIPHATIC HOMOLOGOUS SERIES. *Ann. N. Y. Acad. Sci., 58(2):225-238, March 1954. 10 refs.*

A technique for measuring odorous intensity is described. A standard odorant was picked, and a set of diluted solutions of the standard were prepared. This scale of odorous intensity was physically anchored in terms of the concentrations of the standard. Subjects were then asked to find a concentration of a standard which was as strong as a comparison odor differing in quality. The preparation of the standard odor series, the comparison odors, the subjects, and the procedure are described. Data were obtained from four subjects over a period of 5 months. The results are presented graphically for alcohol and acetate series. The subjects could make quantitative odor intensity matches which were consistent in repeated trials. In broad trends, the data of one subject agreed with the data of another subject, as well as sensory data on loudness and direct heterochromatic photometry. Odorosity (the intensive dimension of odors) decreased with increasing dilution for the compounds studied. Odorosity decreased as a function of increasing chain length for the acetates and alcohols studied, with minor exceptions.

45862 **APTIC NO. 68878**

Eaton, J. R., J. E. Christian, and J. A. Campbell

SURFACE PHENOMENA RELATED TO ODOR MEASUREMENTS. *Ann. N. Y. Acad. Sci., 58(2):239-249, March 1954. 3 refs.*

A method of measuring the intensity of certain known air contaminants is described. The method is based on the surface tension change of a liquid drop. The surface-tension method of measuring air contamination has good reliability and can be used to measure odors. The effectiveness of different deodorants on several specific odorous materials was studied. The results agreed with observations made organoleptically. Research in this field is continuing in two areas: the study of the effectiveness of deodorants on certain odorous substances using the surface- tension method and the search for a method of measuring surface changes by electrical methods. (Author summary modified)

45863 **APTIC NO. 68398**

Greenspan, Joseph

PROBLEMS OF ODOR RESEARCH FROM THE VIEWPOINT OF THE PHYSICIST. *Ann. N. Y. Acad. Sci., 58(2):62-67, March 1954.*

Several theories of the mechanism of odor detection are reviewed from the viewpoint of the physicist. The problem of odor detection in a broad sense exhibits three interconnected components: the source or generator; the detector or sensing element; and the converter-recorder system. These component systems are intimately interconnected. Such a subdivision into components is worthwhile in pointing out differing experimental techniques which are at present available or adaptable for study of these differing component systems. There are many experimental devices and procedures used in the fields of physics, chemistry, engineering, and biology which are applicable to the study of odor. Some of these techniques are reviewed, and their possibilities in furthering odor research are discussed. Methods for preparing gas mixtures, methods for checking mixture compositions such as mass and optical spectrometers, and detectors in odor systems are discussed.

45864 **APTIC NO. 68397**

Kuehner, Richard L.

THE VALIDITY OF PRACTICAL ODOR MEASUREMENT METHODS. *Ann. N. Y. Acad. Sci., 58(2):175-186, March 1954. 24 refs.*

Odor measurement methods and modifications for their use in application studies are described. The two workable methods of odor measurement are organoleptic and chemical. Since all work on the removal of odors must, in the final analysis, be put in terms of human sensibilities, attention was directed toward the dilution-threshold method. Chemical measurements can be used to determine odors in tobacco smoke. Results of studies of these two methods are described.

45865 **APTIC NO. 68871**

Wenzel, Bernice M.

PROBLEMS OF ODOR RESEARCH FROM THE VIEWPOINT OF A PSYCHOLOGIST. *Ann. N. Y. Acad. Sci., 58(2):58-61, March 1954. 19 refs.*

The behavioral aspects of olfactory are discussed. Psychologists recognize the basic problems of odor research as knowledge of the stimulus and how it functions. Some of the work on the modification of the blast injection method has been done by psychologists, but none recently. Many problems of stimulus must be solved by workers in other fields. Psychologists can, however, solve the problem of a lack of a uniform language of olfaction. Some of the other problems which psychologists can solve are discussed.

AIR QUALITY MEASUREMENTS

1974

45866 **APTIC NO. 68440**

Asakawa, Akira

EXPERIMENTS OF THE CHEMISTRY CLUB FOR INVESTIGATION OF AIR POLLUTION. *(Kurabu katsudo de toriagetai jikken - taiki osen chosa). Text in Japanese. Kagaku Kyoiku (Chem. Educ.), 22(4):301-308, Aug. 1974.*

As a high school extra-curricular activity for the chemistry club, measurement of air pollutants was taken up utilizing a simple sampling device and an analyzer. The daily concentrations of nitrogen oxides and sulfur dioxide were measured between June 1972 and March 1974 on the campus of a Tokyo high school. The simple air sampling device suggested by a chemistry article was constructed with rubber, glass, and teflon tubes, and a glass ball filter, and a fish tank air pump. The methods used for NOx analysis were the Jacob method and the Saltzman method; for SO2, electroconductivity and pararosaniline method; for oxidant, phenolphthalene; for ammonia, indophenol; and for lead, photoelectric colorimetry and polarography. The maximum readings of nitric oxide and nitrogen dioxide between July 1972 and March 1974 were 0.82 ppm and 0.123 ppm; the averages were 0.016 ppm and 0.019 ppm respectively. The fluctuations of oxidants and NOx measurements were examined during the summer vacation in 1973 at five locations on the campus. Both oxidant and NOx showed peaks between noon and 2 pm, and the peak tended to appear around noon on sunny days. The NOx tended to be higher at locations closer to the road, but oxidant showed no geographical patterns. The NO2 showed a W-shaped pattern with three peaks in the morning, noon and evening; NO showed a V-shaped pattern with a lower concentration around noon.

45867 **APTIC NO. 68650**

Bloom, Bernard and Albert Smith

AIR QUALITY TRENDS IN ALLEGHENY COUNTY, PA. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 46p., 1974. 11 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 10-13, 1974, Paper 74-1[illegible])*

Trends in sulfur dioxide and total suspended particulate levels in the Allegheny County region are presented for the period 1970- 1974. The air pollution problem in the county is principally due to emissions from stationary sources, with coke, iron, and steel-making operations, as well as the combustion of bituminous steam coals in industrial and utility boilers, being the major sources. Sulfur dioxide levels in the highest polluted areas of the county decreased sharply during 1970-1974 from three or four times the primary annual average standard of 80 micrograms/cu m to less than twice this standard. Concomitant reductions of the same degree in the rate of exceedance of the primary 24-hour standard have not occurred. The sharp annual reductions are a result of industrial conversions to lower sulfur coals and fuel oil and to the increased desulfurization of coke-oven gas. The county is expected to achieve the annual primary standard and perhaps the 24-hour standard by 1976. Total suspended particulate levels decreased from 1970-1972, though in the steel industry-dominated Monongahela River Valley an increase in total suspended particulates began in mid-1972 and is continuing through the first quarter of 1974. The trend is closely associated with production trends in the steel industry of western Pennsylvania. The quantitative relationship between steel mill activity and particulate levels is complicated by the existance of copious fugitive emissions from steel-making operations which render the usual modeling computations inapplicable. Development of receptor-oriented suspended particulates rose analysis has been successful.

45868 **APTIC NO. 69157**

Boehm, G. and Ruth Leuschner

RECORDING DUST PARTICLES FROM THE SAHARA BY MEANS OF BURKARD S POLLEN AND SPORE TRAP. *(Registrierung von Saharastaubfaellen mit Hilfe einer Burkard Pollen- und Sporenfalle). Text in German. Experientia, 30(5):574-576, May 1974. 13 refs.*

Particles of dust, probably originating from the Sahara, were discovered on the adhesive tape of a Burkard pollen and spore trap used for continuous particulate measurements in Basel, Switzerland. A subtropical warm air stream was associated with the dust transport. Analogous findings were made less than a year later (June 27, 1973) after the original observations (February 7 and 8, 1972). Monitoring of this type is recommended for as many locations as possible in Europe, especially when the appropriate meteorological conditions exist.

45869 **APTIC NO. 68591**

Braman, R. S. and D. L. Johnson

ANALYTICAL STUDIES ON THE SPECIATION OF AMBIENT LEVELS OF MERCURY IN AIR. *Preprint, Commission of the European Communities, Environmental Protection Agency, Washington, D. C., and World Health Organization, New York, 6p., 1974. 2 refs. (Presented at the International Symposium - Environment and Health, Paris, France, June 1974.)*

Analytical studies on the speciation of ambient levels of mercury in air are described along with an analytical method for the determination of several forms of mercury in air at concentrations down to 0.1-1 ng/cu m. Particulate mercury, elemental mercury, methylmercury(II) compounds, volatile inorganic mercuric compounds, and dimethylmercury are collected from air samples onto previously blanked specific absorption tubes. These are analyzed by thermal desorption of the mercury compounds and detection of mercury by emission spectroscopy in an electrical discharge using a helium carrier gas. The analysis has a detection limit near 0.03 ng/cu m for elemental mercury, dimethylmercury, and particulate mercury. The specific absorption tubes for methylmercury compounds and volatile inorganic mercuric compounds have detection limits near 0.3 ng/cu m. An analysis of several forms of mercury carried out over a sampling grid in the Tampa, Florida area indicates that elemental mercury is the major form of mercury in air both within and outside of buildings. Significant amounts of mercuric chloride-type compounds are also present. Mercury concentrations inside places of human habitation are far greater than outside. Inorganic mercury appears to be rapidly converted to methylmercury compounds and elemental mercury in the soil. Mercury in the air above the Sargasso Sea is generally lower in total mercury than over land areas.

45870 **APTIC NO. 68601**

Brun, M.-J.

INFLUENCE OF AIR POLLUTION IN INDOOR AIR QUALITY. *(Influence de la pollution atmospherique sur la qualite de l air a l interieur des locaux). Text in French. Centre Interprofessionnel Technique d Etudes de la Pollution Atmospherique, Paris (France), C.I.T.E.P.A. Etudes Documentaires 43, CI 812, 22p., Nov. 4, 1974.*

Studies on the relationship of indoor to outdoor concentrations of particulate matter and other pollutants are reviewed. The indoor-outdoor ratio of the particulate concentrations decreases in winter and at night as the windows are shut most of the time. This ratio was usually found between 80 and 100%. Refrigerating ai were highly effective in the abatement of the indoor-outdoor ratio for coarse dust fractions, but not for respirable dust and gases. The indoor-outdoor ratio for sulfur dioxide, ranging from 20 to 71%, is higher in summer than in winter, and lower at night. The indoor-outdoor ratio for carbon monoxide was between 80 and 100% for outdoor concentrations below 10 ppm, and between 60 and 80% for outdoor concentrations over 10 ppm. The indoor and outdoor concentrations of nitrogen oxides and peroxyacetyl nitrates were largely the same. The indoor-outdoor concentration of pollen decreases when the outdoor concentration increases; 85-100% at low outdoor concentrations, and 1-5% for 100 particles/cu m and over. There seemed to be no relationship between the indoor and outdoor concentrations of spores and bacteria.

45871 **APTIC NO. 68634**

Gordon, G. E., W. H. Zoller, and E. S. Gladney

ABNORMALLY ENRICHED TRACE ELEMENTS IN THE ATMOSPHERE. *Missouri Univ., Columbia, Trace Subst. Environ. Health, Proc. Univ. Mo. Annu. Conf., 7th, Columbia, Mo., 1974, p. 161-166. 21 refs.*

Concentrations of trace elements in atmospheric particulate matter from urban, rural, oceanic, and polar regions are examined. Several trace elements are enriched by up to several oders of magnitude relative to elemental concentration patterns of crustal materials. Man-made sources responsible for much of the enrichment have been established for some enriched elements such as lead. Attention is focused on enriched trace elements whose sources are not well characterized, particularly zinc, copper, antimony, selenium, and arsenic, as well as vanadium, iron, nickel, cadmium, and lead. These elements are often enriched by 100-fold or more relative to other elements in both clean and polluted air. Concentrations of these elements in several source materials are examined in an attempt to determine their major sources. The source materials include coal, steam plant coal, particles beyond a precipitator, residual fuel oil, and municipal incinerator fly ash. Nonurban and urban enrichment factors are also given for several cities. (Author abstract modified)

45872 **APTIC NO. 69070**

Hanst, P. L., W. E. Wilson, R. K. Patterson, B. W. Gay, and L. W. Chaney

A SPECTROSCOPIC STUDY OF PASADENA SMOG. *Am. Chem. Soc., Div. Environ. Chem., Prepr., 14(1):287-294, 1974. (Presented at the American Chemical Society, Division of Environmental Chemistry, National Meeting, 167th, Los Angeles, Calif., April 1-5, 1974, Paper 54.)*

A spectroscopic analysis was made of Pasadena smog based on air samples in late Nov. 1972 and July-Aug. 1973. A typical spectrum from the fall period shows these concentrations: carbon monoxide, 5 ppm; methane 2.5 ppm, paraffinic carbon, 1.0 ppm; acetylene 0.050 ppm; ethylene 0.050 ppm. In the summer period the CO and hydrocarbon levels were about half as high as on the fall mornings and evenings. On July 24 and 25, ozone concentrations reached 0.60 and 0.68 ppm. Carbon monoxide was about 3 ppm, methane 72 ppm, and ethylene only 0.007 ppm, reflecting the stagnant condition of the air and the high extent of reaction. Formic acid was the organic reaction product at the highest concentration of 0.050 ppm. Peroxyacetyl nitrate at 0.040 ppm was the only identifiable nitrogen-containing product. There were indications of acetic acid, hydrogen peroxide, traces of fluorocarbons, and methanol. Compounds not detected include nitric acid, methyl nitrate, nitrogen pentoxide, ammonia, and formaldehyde.

45873 **APTIC NO. 69172**

Hasegawa, Yutaka

INTERNATIONAL TRENDS IN COUNTERMEASURES AGAINST PHOTOCHEMICAL AIR POLLUTION. *(Kokagaku taiki osen taisaku no kokusaiteki doko). Text in Japanese. Seikatsu to Kankyo (Life Environ.), 19(9):63-67, Sept. 1974.*

A preliminary conference was held by 11 countries in Paris on the subject of oxidants and substances causing oxidants in Jan. 1973. An agreement was reached in this conference that member nations would present a report dealing with such items as sources of primary pollutants and the countermeasures to be adopted, surveillance and monitoring of oxidants and primary pollutants, and prediction and warning systems to the air control section of the Organization for Economic Cooperation and Development to be held in spring 1974. Representatives of the U.S.A., Australia, and Japan met in Sydney in March 1974 to draft original reports. In respect to photochemical smog, air pollution in Los Angeles is overwhelmingly worse in terms of concentration and the number of occurrences of photochemical smog than Tokyo or Sydney, and air pollution in Sydney is approaching Tokyo-type air pollution. With regard to nitrogen oxides annual mean values of 0.02 and hourly maximum values of 0.33 ppm were registered in Sydney in 1973, while in Tokyo the annual mean value was 0.05 ppm in 1972. Total hydrocarbons and non-methane hydrocarbons in Sydney were 1.5 and 0.2 ppm in 1973. Total hydrocarbons in Tokyo were 2.3 ppm.

45874 **APTIC NO. 68340**

Hay, D. R. and V. E. Sells

THERMAL PLUMES IN AN URBAN ENVIRONMENT. *Preprint, Canadian Meteorological Society, 7p., 1974. 2 refs. (Presented at the Canadian Meteorological Society, Annual Congress, 8th, Toronto, Ontario, May 29-31, 1974.)*

Experimental lidar observations on particulate profiles over the city of London and on thermal plumes above urban roadways in the city are described. The thermal plumes observed generally appear when the sky is predominantly clear and winds are less than 10 mph; they are notably absent during dark hours and periods of heavy overcast. Three local enhancements of particulate concentration appear above the background level for lidar observations above urban roadways: two are above roadway crossings and one is above a university building between the roadway crossing. The latter is attributed to a very thin vapor plume, while the former are due to particulates rising from the road surface or from vehicles travelling over it. Preliminary analysis indicates a close association between the incidence of road plumes and the passage of heavy vehicles, with thy local plumes containing particulate mass loadings of 2-3 times that of the general background. The major mass concentrations have particle radii in the range of 1-2 micron.

45875 **APTIC NO. 68724**

Inoue, Ichiro

POLLUTION. *(Kogai). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan (Tokyo)), 53(6):574-582, June 1974. 61 refs.*

The average sulfur dioxide concentration measured at 15 stations in Tokyo decreased from about 0.055 ppm in 1965-1968 to 0.031 ppm in 1972. In 1972, each of 685 stations in 248 cities had more than 6000 hours of SO2 measurement and among them 670 stations in 236 cities had an SO2 concentration below the environmental standard issued in Feb. 1969. In the same year, 103 out of 104 stations throughout the country gave a nitrogen dioxide concentration above the environmental standard. The annual average concentration was about 0.025 ppm, with 14 stations having a concentration higher than 0.04 ppm. Carbon monoxide concentration in Tokyo showed a decreasing trend since 1970 due to the enforcement of automotive exhaust controls. New environmental standards for sulfur oxides, carbon monoxide, and particulates were given in 1972 and those for nitrogen oxides and photochemical oxidants were given in May, 1973. The new standard for SOx was about one-third that of the old standard. The monitoring stations for various pollutants increased significantly and at the end of 1972, there were 791 stations for SO2, 176 for NOx, 184 for photochemical oxidants, 62 for hydrocarbons, and 486 for airborne particulates. New automobile engines and exhaust cleaning devices have been developed as countermeasures against automotive air pollution.

45876 **APTIC NO. 68688**

Ishida, Munemichi

THE SYSTEM OF THE ENVIRONMENTAL PROTECTION IN ISHIKAWA PREFECTURE- THE PLAN TO PREVENT THE ENVIRONMENTAL POLLUTION FROM OCCURRING IN THE UN-POLLUTED AREAS. *(Ishikawa-ken ni okeru kogai boshi shisutemu--hi osen chiiki ni okeru mizen boshi keikaku). Text in Japanese. Fujitsu, 24(4):1-9, 1974.*

The main industry of Ishikawa Prefecture is agriculture and the secondary industry, 37.3% of the total revenue, consists mainly of textile and machinery manufacturing. Large scale pollution sources are limited, since most of the secondary industries do not require much energy consumption, and the air pollution load is relatively light. The total sulfur oxide concentration of the Prefecture, by yearly averages, ranges between 0.008 and 0.016 ppm, which passes the environmental standard. But hourly concentrations can exceed the standard locally two or three times a year, and a short-term pollution control program becomes necessary. Seasonally, the concentrations in urban areas increase drastically in the winter due to the heating systems. Pollution by carbon monoxide is heavy in main traffic intersections of Kanazawa, and the nitrogen oxides concentration is also rather high. A large scale air pollution monitoring network was started in 1973. The number of monitoring stations with telemeters, completed and in progress, is 12, six more stations are planned for; four telemeter automotive emission monitoring stations have been completed or are in progress, with two more in planning stages. In addition, mobile monitoring conveyances, weather observation stations, emission source monitoring stations, alert communications stations, and data transmission stations are planned for future construction.

45877 APTIC NO. 68689

Kanamaru, Tsuyoshi, Tamaki Hashizume, Norihito Miyamura, Yumiko Kobayashi, Miwa Takatsuka, Senichiro Shirai, Hirohisa Shima, Hozumi Tamura, and Masazumi Kawakami

AIR POLLUTION INVESTIGATION IN YOKKAICHI-NITROGEN OXIDES MEASUREMENT BY ALKALINE FILTER PAPER.

(Yokkaichi-shi ni okeru taiki osen chosa--arukari roshi-ho ni yoru chisso sankabutsu sokutei kekka). Text in Japanese. Mie-ken Kogai Senta Nenpo (Mie Prefect. Pub. Nuisance Center Annu. Rep.) no. 2:61-67, March 1974. 23 refs.

The nitrogen oxides concentration in the air of Yokkaichi was measured by the alkaline filter paper cylinder and the Saltzman automatic meter methods between April 1969 and Feb. 1973. Alkaline filter paper was prepared by soaking paper in potassium carbonate liquid and drying it. The paper was wrapped around polyvinyl chloride cylinders and left in a shelter on location for one month. After that period, the paper was minced, and NO_x was extracted with 100 ml of water and analyzed by the standard method. The measurements taken at 16 locations varied between 9 micrograms and 388 micrograms/day/100 sq cm. The pollution was heavier in the industrial areas and in winter. However, in areas with much automobile traffic, the measurements were generally higher. There was a 23% decrease between 1970 and 1972, though no change had occurred between 1969 and 1970. A high correlation (especially in winter) was noted between the sulfur oxides measurements taken by the lead dioxide method and the NO_x measurements taken by the alkaline filter paper method at the same locations. But the 1972 correlations were lower than before. The concentration of NO_2 by this method was about 1/15 of the SO_2 measurement, but the ratio was higher in winter. There was a constant correlation between the alkaline filter measurements and the Saltzman measurements. The theeoretical distribution calculated by emission quantity and the measurements taken by the alkaline filter paper generally agreed.

45878 APTIC NO. 69042

Kobayashi, Yumiko, Susumu Tsukada, Hiroshi Hirobe, Masaaki Takahashi, and Noriyoshi Ito

REPORT ON THE ODOR INVESTIGATIONS IN FACTORY AREAS.

(Kojo fukin ni okeru alishu chosa kekka ni tsuite). Text in Japanese. Mie-ken Kogai Senta Nenpo (Mie Prefect. Pub. Nuisance Center Annu. Rep.), no. 2:102-107, March 1974. 3 refs.

As part of an investigation of odors in factory areas, the concentration of hydrocarbons in the Yokkaichi Petrochemical Complex were measured by flame ionization detector. The low boiling point aliphatic HCs measured were from propane to methyl cyclohexane, and aromatic HCs were from benzene to o- xylene. The maximum figures for the total HC was 612.9 ppb in the center of the complex, 440.7 ppb at a nearby point, and 363.2 ppb further south. Sixty to 70% of the total pollutants at these points had carbon numbers of 3 and 4. Next, phenols in the vicinity of a glass fiber factory were measured by a six- sequence air sampler with impingers and gas chromatography. The phenol measurements at four locations ranged between 4 and 5.6 ppb; O-cresol was not detected, and m,P-cresol ranged between 2.3 and 10.3 ppb. Odors in the vicinity of a Kraft pulp mill were also investigated. The samplings were taken at the liquid waste treatment plant, a southern limit of the factory ground, the east gate of the plant, and three points near the digester plant. Methyl mercaptans and dimethyl sulfide were measured in the ranges between 0.9 and 1097 ppb. The odor intensity on the ground limits were as high as 3 to 3.5; and some control measures are strongly desired.

45879 APTIC NO. 68665

Kohamatsu, Hideyuki, Yukio Shoji, and Mitsu Sone

INVESTIGATION OF AIR-BORNE PARTICULATE CONCENTRATION AT INDUSTRIAL AREA OF ISHINOMAKI HARBOR.

(Ishinomaki kogyoko kohaichi ni okeru fuyufunjin chosa kekka). Text in Japanese. Miyagiken Kogai Gijutsu Senta Hokoku (Miyagi Prefect. Pollut. Contr. Tech. Center Rep.), no. 2:20-23, April 1974.

Pollution by airborne particulates arising from factories located in the machine-metal industrial area at the west end of Ishinomaki harbor was investigated. A low volume air sampler was used for one-month continuous sampling, while high volume air sampler was used for one-day sampling. The amount of airborne particulate collected on paper filter was weighed after leaving it in a desiccator for two days. One-month samplings were carried out at two places for 6 mo from April to September 1973, while one-day samplings were done at five places twice. Heavy metals in particulates were dissolved into 1% nitric acid and analyzed by atomic absorption spectrophotometer. The averaged values of pollutants (microgram/cu m) collected for 1 mo at places A and B were 44.2 and 37.2 for airborne particulates, 0.095 and 0.61 for iron, 0.20 and 0.12 for zinc, 0.044 and 0.025 for manganese, 0.057 and 0.052 for lead, 0.031 and 0.007 for copper, and 0.003 and 0.002 for cadmium. The percentages of Zn, Mn, and Cu in particulates collected at A and B were 2 - 3 times larger than those collected in a non-polluted area. The percentage of total heavy metal content except for Fe was 8.0% at A and B, while it was only 2.4% at non-polluted area. The Zn percentage in particulates collected in the steel mill was much higher than that measured at the non-polluted area. To check the effect of the steel mill on pollution the dependency of the amount of airborne particulates, together with heavy metal contents, upon the distance from the steel mill was measured. The amount of particulates clearly decreased with the distance. Contents of Fe and Mn also decreased with the distance. The relation was not clear in the case of Zn content.

45880 APTIC NO. 69083

Matsumura, Tetsuo

NATION-WIDE OUTLOOK ON PHOTOCHEMICAL SMOG.

(Kokagaku sumoggu no zenkokuteki tenbo). Text in Japanese. Ao to Midori (Blue Green), 3(8):34-38, Aug. 1974. 3 refs.

Tokyo issued an oxidants warning in 1970. Prefectures adjacent to Tokyo Bay, Osaka Bay, and Ise Bay which are densely populated and in which large industrial areas are located issued warnings in 1971. Areas adjacent to the inland Sea of Seto plus the above-mentioned three areas issued oxidants warnings in 1972. In 1973 photochemical smog exceeding the warning level occurred in the northern prefectures of the Kanto plain, Shizuoka Prefecture, and even in Sendai Prefecture. The number of oxidants warnings for 1972 and 1973 classified by month is presented. Oxidants warnings are more frequently issued in July and August than any other month. This is ascribed to the summer air pressure distribution in which high atmospheric pressure spreads throughout Japan extensively after the rainy season is over. The reported number of victims of photochemical smog is not always proportional to the increase in the number of emergency alerts. Half of the victims are junior high school students and 30% are elementary and senior high school students.

45881 APTIC NO. 68477

Nakamura, Kiyoshi

STUDIES ON DUST EMISSIONS FROM ELECTRIC FURNACE STEEL PRODUCTION.

(Denkiro seikoho yori haishutsu sareru funjin ni kansuru kenkyu). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 94-97, 1974. (Presented at the Japan Chemical Society Powder Symposium, 12th, Sendai, Japan, Oct. 2-4, 1974, Paper 3L01.)

Dust emissions from electric furnace steel plants of Itoh Steel Company, Japan were analyzed from the standpoint of pneumoconiosis mineralogy, to determine the validity of complaints that these dust emissions have caused skin disorders since 1972. There has been no previous mention in literature of skin disorders connected to electric furnace steel production either in Japan or elsewhere. Scanning electron microscopy, X-ray diffraction, and chemical techniques were used to determine the composition, characteristics, and microtopography of dust particles. Elements present were determined by fluorescent X-ray analysis. The main components of dust emitted from the steelworks were magnetite (Fe_2O_4) and zincite (ZnO). Small amounts of gamma-ferric oxide, alpha-Fe_2O_3, ferric chloride, and lead oxide, among other compounds, were found. These compounds have not been cited in literature as causing skin disorders, so the cause of the problem is still unknown.

45882 **APTIC NO. [illegible]**

Nakao, Atsuyoshi, Masaru Saito, and Shunsuke Funahashi

THE CONCENTRATION OF CARBON MONOXIDE IN UNDERGROUND FLOOR OF BUILDING. *(Biru no chikakai ni okeru CO nodo no chosa kekka to mondaiten). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 12(2):43-50, July 1974.*

According the 1971 investigation of carbon monoxide level in buildings in Tokyo, those failed to pass the CO environmental standard of 10 ppm were 16.4% offices, 19% stores, and 33.3% department stores; for 1972, the percentages were 11.4% offices, 16.4% stores, and 28% department stores. In the winter and summer of 1973, investigations were conducted for the CO levels of the air in the underground facilities of various buildings with more than 8000 sq m in six central districts of Tokyo and in part of the rural Tama district of Tokyo. The number of buildings investigated were 273 in winter and 115 in summer. The measurements were taken in the first and second levels of underground floors, excluding kitchens and parking lots. Nondispersive infrared analyzers and the electrochemical method were used for analysis for samples taken at 75-120 cm from the floor level. In winter, 17.9% of the total buildings investigated failed to pass the 10 ppm standard. The highest ratio was 16.2%, which comprised undergorund restaurants of all types. In summer, 26.1% of the buildings exceeded the environmental level of 10 ppm. Ordinary air conditioning systems do not remove CO; therefore, the level of CO of outside air which is taken in by these buildings naturally affects the level of CO inside. In Central Tokyo, the mean level of CO is 3.1 ppm on the roof, and 4.8 ppm on the first floor level. In the Tama district, it is 0.6 ppm on the roof and 0.7 ppm on the first floor.

45883 **APTIC NO. 69004**

Nishida, Konosuke, Tsuneo Honda, Takashi Suzuka, Kazuhiko Mitsuoka, and Masanobu Yamakawa

STUDIES ON THE COMPREHENSIVE EVALUATION OF ENVIRONMENTAL POLLUTION (II) --FROM THE CASES IN OSAKA PREFECTURE. *(Kankyo osen no sogo hyoka ni kansuru kenkyu--Osaka funka ni okeru jitsurei kara). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 10(9):49-57, Sept. 1974. 53 refs.*

In June 1971, parents of sixth grade pupils in the Osaka region were asked to answer a questionnaire regarding environmental pollution. Seventy-four schools were selected by random sampling, and more than 10,000 questionnaires were distributed. An 83.8% reply resulted. A numbered grid was superimposed on the region under consideration, and weighted answers to the 14 questions covering six areas of environmental damage were analyzed and plotted on the grid. The environmental factors in the survey included sulfur oxides, atmospheric dust, the combined action of oxides and dust, noise, traffic intensity, water pollution. The rankings of the answers ranged as follows: 5 (impossibly bad), 4 (bad), 3 (somewhat bad), 2 (normal), 1 (better than normal). The core area centering in Osaka City and its neighboring environs contained many grids ranked 5. Rankings of 3 and 4, indicating environmental deterioration, were common in areas adjacent to this area.

45884 **APTIC NO. 68967**

Ogata, Yoichi, Shozaburo Ishido, Yoko Shinkyo, and Ryoji Ohkura

DUST CONCENTRATION IN UNDERGROUND ARCADE (THE CASE OF OSAKA MINAMI UNDERGROUND ARCADE NIJINOMACHI). *(Chika shotengai no fuyu jinai nodo ni tsuite (Osaka Minami chikagai Nijinomachi no baai)). Text in Japanese. Preprint, Japan Society of Architecture, p. 157-158, 1974. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4079.)*

The suspended particulate concentration in a subterranean shopping center in Osaka was measured at six locations in and out of the shopping center from Aug. 17 to Sept. 3, 1972. The diurnal variation in dust concentration was measured and evaluated by means of concentration index. In the case of outside air, two peaks, one at 8-9 am and the other in the evening, were observed, while no such peaks were shown inside the shopping center, indicating the efficiency of the electric dust collector and air filter. The concentration index of air supply was 3-4, and that in hallways was slightly higher. The suspended particulate concentrations measured by digital dust meter were less than 0.10 mg/cu m in all cases, which were well below the Building Sanitation Control Standard of 0.15 mg/cu m.

45885 **APTIC NO. 68945**

Umehara, Koichi

RESULTS OF THE AUTOMOTIVE EXHAUST POLLUTION INVESTIGATION IN SHIZUOKA PREFECTURE. *(Shizuoka-ken ni okeru jidosha haigasu ni yoru taiki osen no chosa kekka). Text in Japanese. Shizuoka- ken Kogai Boshi Senta Nenpo (Bull. Environ. Pollut. Contr. Res. Center Shizuoka Prefect., no. 1:67-117, March 1974.*

The state of pollution by automotive exhaust gases was investigated on the main national highway and in major cities in Shizuoka Prefecture between Nov. 1969 and Aug. 1970. The number of automobiles was counted, carbon monoxide was measured by a detector every 15 min in 1969, and sampled by polyethylene bags and applied to non-dispersive infrared analyzers in 1970. Nitrogen oxides were sampled by automatic samplers and by the Saltzman reagent. Sulfur oxides were measured by automatic meters. Oxidants were sampled by manual samplers and atomic absorption spectrophotometry. Hydrocarbons were measured by detectors. The pattern of CO concentration was about 10.6 ppm with the average of 3900 cars, and 14 ppm with 5000 cars. In Shizuoka, the oxidant concentration was relatively high, and the 8-hour average was 0.12 ppm. The highest hourly measurement was 0.15 ppm. The highest 8-hour average of CO in Shizuoka was 10.5 ppm with traffic of 3738/hr cars. The highest CO measurement in Fuji city was 9.3 ppm, and the average traffic was 1494 cars/hr.

45886 **APTIC NO. 69061**

Whitby, K. T., W. E. Clark, V. A. Marple, K. Willeke, G. M. Sverdrup, D. Y. H. Pui, and B. Y. H. Liu

PHYSICAL CHARACTERIZATION OF CALIFORNIA AEROSOLS. *Am. Chem. Soc., Div. Environ. Chem., Prepr., 14(1):29-32, 1974. 2 refs. (Presented at the American Chemical Society, Division of Environmental Chemistry, National Meeting, 167th, Los Angeles, Calif., April 1-5, 1974, Paper 7.)*

Three papers on the physical characteristics of aerosols measured in background, urban, and source-related sites in California are summarized. Measurements of the aerosol size distribution at the Goldstone tracking station in the Mojave Desert show only 60-70% of the total aerosol volume was greater than 1 micron. There was no evidence of windblown dust, but there was an incursion of aged smog aerosol. Measurements at the Hunter-Liggett site indicate incursions of dilute air pollution affected the results. There was some photochemical activity, and concentrations of ozone reached 0.1 ppm. At a Santa Monica site, there were high concentrations of submicron aerosol from air pollution over the land. The fresh aerosol measured at a distance 150 ft from the Harbor Freeway in Los Angeles was mostly below 0.15 micron in diameter. Fresh combustion aerosol from aircraft taking off from the San Francisco airport was similar to freeway aerosol except the concentration was lower and the aerosol came in bursts.

45887 **APTIC NO. 69046**

Yoshizawa, Shin

AIR POLLUTION NEAR BUILDINGS. *(Tatemono shui no taiki osen). Text in Japanese. Kisho Kenkyu Noto (Meteorol. Study Note), no. 119:166-169, 1974. 8 refs.*

The results obtained from measurement of air pollution conditions inside buildings and those adjacent to the buildings are presented. Although the concentrations of soot and smoke are low inside the buildings with air-conditioners. The concentrations inside buildings with natural ventilation are the same as those adjacent to the buildings. Substances such as sulfur dioxide are reduced to from 1/4 to 1/5 the outdoor concentration inside the building without using any equipment to eliminate SO2. In some cases the concentration of carbon monoxide is higher inside the buildings. In order to limit the concentration of pollutants inside buildings to specific value, the efficiency of purifiers set up in buildings must be improved or air must be prevented from flowing into the buildings from outside. Soot, smoke, gas, and odor can be eliminated by filters and activated carbon. Air can be prevented from coming in from outside by shutting the windows tightly or increasing pressure inside the buildings. The concentration of pollutants and their fluctuation characteristics affect the environment inside the buildings directly. Extensive diffusion of air pollution in the upper part of the air over big cities, properties of sources of air pollutants adjacent to the buildings, forms of the buildings, and geographical forms of the area surrounding the buildings all affect the environment inside the buildings.

45888 **APTIC NO. 63406**

POLLUTION ADMINISTRATION IN SHIZUOKA CITY. *(Shizuoka-shi no kogai gyosei). Text in Japanese. Kankyo Kenkyu (Environ. Studies), no. 6:70-80, May 1974.*

The measurements of sulfur oxides have been taken automatically since 1970 in Shizuoka city. The 1972 measurements taken at five locations showed a large decrease compared with the 1971 measurements and they were all under the environmental standard. The hourly averages throughout the year ranged between 0.002 and 0.009 ppm. Suspended particulates have been measured since 1971, and the year s average was 0.063 mg/cu m; the 1972 measurements average decreased to 0.025 mg/cu m. In 1971, hourly averages exceeded 0.2 mg/cu m for 211 hr, but none in 1972. Settling particles were measured at 26 locations, and the highest yearly average was 9.101 kg/sq km, and the lowest was 2.243 kg. The highest monthly average of carbon monoxide in 1972 was 24.7 ppm in November at a busy intersection, but at the same point, the measurement in January and February were 0.0 ppm. The total hydrocarbon measurement maximum was 10 ppm in July and June, and the maximum was 0.0 ppm in January and March. Nitrogen oxides monthly averages were 0.500 ppm at most for every month except August. The maximum oxidant measurement was 0.085 ppm in August, and the minimum was 0.001 ppm. Generally, all pollutants are decreasing because of more stringent standards and enforcement.

45889 **APTIC NO. 68997**

Tomakomai Port Authority

DATA ON THE TOMAKOMAI EAST PORT HARBOR PLAN (ENVIRONMENTAL PROTECTION PLAN). *(Tomakomai-ko Toko chiku kowan keikaku shiryo (kankyo hozen keikaku). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 29:29-58, March 1974.*

The development of a large scale industrial site is scheduled for 1978 in East Tomakomai (east port area). As part of preliminary studies, a survey of the present condition was conducted, and the future environmental protection plan was developed. Situated in south Hokkaido, the city is flanked by a 1024 m high hill and a lake in northeast, faces the Pacific ocean on the south with rolling sand dunes along the shore, and has a vast desert on the east side. East Tomakomai has no air pollutant emission sources at present, but central Tomakomai has a large coastal industrial belt of paper and pulp industries, and the central city and the shore area are heavily polluted. The level of sulfur dioxide pollution has improved with peaks in 1969 and 1970, and the present annual average is 0.008-0.021 ppm. The nitrogen oxide pollution is about 0.009-0.012 ppm and passes the environmental standard 84.7%- 100% of the time. The level of suspended particulates also passes the environmental standard most of the time. The target for SO2 load for the present Tomakomai area is 1600 N cu m/hr for 1978, which will require a reduction of 3200 N cu m/hr. The present sulfur content in the fuel is 1.7%, but the plan requires a reduction to an average of 0.6%. For the proposed East Tomakomai site, the projected fuel consumption will be 281 kl/hr for 1978, the sulfur content 0.4%, and the emission quantity target will be 550 N cu m/hr with the total emission quantity of 4,170,000 N cu m/hr. The total allowable NOx emission for the present Tomakomai area will be 1100 N cu m/hr, and 750 N cu m/hr for East Tomakomai with about 180 ppm of emission concentration for boilers. The target daily average for suspended particulates will be less than 0.10 mg/cu m/air/hr.

45890 **APTIC NO. 69034**

Kawasaki Municipal Government (Japan) Bureau of Pollution Control

AIR POLLUTION IN KAWASAKI, NO. 12, 1972. *(Kawasaki-shi ni okeru taiki osen). Text in Japanese. 303p., May 1974.*

The state of air pollution in Kawasaki is discussed. The measurement of sulfur oxides, settling particles, suspended particulates, nitrogen oxides, oxidants, carbon monoxide, the weather are presented with data in graphs and tables. The use of mobile monitoring cars and the emission source monitoring system are discussed. The automatic monitoring devices for emission sources were installed in Sept. 1972 at major factories in Kawasaki. The devices include a fuel flowmeter, a fuel sulfur analyzer, and flue gas sulfur dioxide measurement equipment. The data are directly sent to the Environmental Monitoring Center by telemeter every 15 min. After a period of adjustment, the data communication began to function smoothly with errors within 10% after December. But the data on SO2 emission is calculated by the fuel consumption, specific weight, and the S ratio, and the emissions from sources other than the 42 factories are not taken into consideration. A large discrepancy between actual condition and measurements is expected. The purpose of the monitoring system to counter the emergency situation and to enforce the cooperation of major factories. This has shown some effect in the case of Dec. 6, 1972, when a heavy SO2 prediction was made in the morning for 10 am to 3 pm. In all factories, the total SO2 emission began to decrease about 11 am, and locally, the minimum level was reached at noon. There was no decrease after 1 pm. In this city, high oxidant concentrations tend to appear in the north. The causes were investigated, and three types of oxidant meters were found to give vastly different results, two of them heavily affected by the level of nitrogen dioxide.

1973

45891 **APTIC NO. 68618**

Dytch, Harvey E.

INVESTIGATIONS OF AEROSOL OVER ST. LOUIS. *Chicago Univ., Cloud Physics Lab., National Science Foundation Grant GI 33373, 13p., 1973 (?).*

Studies of the following are described: the geographical variation of aerosols over the St. Louis area, usually coordinated with ice nuclei measurements; vertical cross-sections of the urban atmosphere using continuous monitoring of aerosol distribution, solarimeter data, and state parameters; and of aerosol data in conjunction with cloud condensation nucleus sampling. The instrumentation for aerosol measurements consisted of active scattering aerosol spectrometers which sized particles by measuring the amount of light scattered into a collecting aperture during particle interaction through an active laser beam. Results of constant level aerosol mapping are presented in an aerosol map, and vertical cross-sections of aerosol concentration and density are presented in graphs. The urban area appeared as a strong source of aerosol contamination, with a marked confining effect of the upper level inversion, in data from Jan. 28, 1972. The influence of the vertical temperature structure was evident on Aug. 4, 1972, with only one small pocket of aerosol successfully penetrating the inversion and making its way to the highest flight level. The plume was also distinctive in terms of the size distribution of the particles, with increased concentrations resulting primarily from an increased number of smaller particles. Comparisons were made between the aerosol size spectra recorded in flight at the time of cloud condensation nuclei (CCN) air sampling and CCN spectra as subsequently determined in a ground- based measurement.

45892 **APTIC NO. 68784**

Ekstedt, Jan and Svante Oden

CHLORINATED HYDROCARBONS IN THE LOWER ATMOSPHERE IN SWEDEN. *(Klorerade kolvaten i den marknare atmosfaren i Sverige). Text in Swedish. Preprint, Lantbrukshogskolan, Uppsala (Sweden), Forskningsavdelningen for miljovard Inst. for markvetenskap, 16p., 1973. 8 refs.*

The DDT and PCB (polychlorinated biphenyl) content measured in the air and in settling particulate matter in different parts of Sweden are presented. Soot in snow samples taken in and at 10 and 30 km from Uppsala contained 1200, 2800, and 3470 nanograms of total DDT per g of soot, and DDT fallout of 2120, 1240, and 960 nanograms/sq m/mo were measured. The op-DDT to pp-DDT ration was between 0.28 and 0.41, while the DDE-DDT ration ranged from 3.2 to 4.9. The PCB content in the soot ranged from 230 to 4900 nanograms/g. Dust samples from a locality where DDT had been stored contained 1295 ppm DDT. Gas chromatographic analyses of the DDT content in the air in different places in Sweden showed the presence of PCB s in 38 out of a total of 200 filter samples, while DDT was present in all but one of 200 samples. The pp-DDT content showed seasonal variations with a minimum of 0.09-0.1 nanograms cu m in winter, and a maximum of 0.35-0.45 nanograms/cu m in summer. The minima seemed to increase at higher latitudes, whereas the maxima showed a reversed latitudinal gradient. Consequently, there seem to be two different systems for the atmospheric transport of DDT; during winter, the polar region was a source of DDT, while evaporation was prevalent in summer.

45893 **APTIC NO. 69169**

Gerhardt, Burrell B., Denis E. Donnelly, Richard G. Griffin, and Robert F. LaForce

COLORADO TUNNEL VENTILATION STUDY (FINAL REPORT). *Dept. of Highways, Denver, Colo., Planning and Research Div., Rept. CDOH-P and R-R and SS-73-5, E0056, 76p., Sept. 1973. 15 refs.*

NTIS: PB-231 889

The pollution concentration in existing tunnels in Colorado was determined and the length of tunnels which will need mechanical ventilation were determined. Tunnels up to 1000 ft are considered self-ventilating, and tunnels over 3000 ft need some means of mechanical ventilation. Vehicles going 45 mph, spaced 50 ft apart will normally build up the carbon monoxide concentration to 170 ppm in a 2000 ft tunnel and to 250 ppm in a 3000 ft unventilated tunnel. The average CO value for 160 readings in tunnels under 1000 ft long was 8.2 ppm; for hydrocarbons it was 4 ppm; and for nitrogen oxides it was 0.17 ppm. There is a fairly good correlation between CO concentration and hydrocarbon concentration (.344) and a very good correlation between CO concentration and NOx (.722). The concentration of NOx is approximately .015 times the concentration of CO. The greatest pollution concentration conditions occur when vehicles are stopped and engines continue to idle. When vehicles are in motion the induced wind will be approximately 7 mph and contribute significantly to the dispersion of pollutants.

45894 **APTIC NO. 69132**

Hocking, Drake

AIR QUALITY MANAGEMENT FOR NATURAL GAS PRODUCTION IN ALBERTA: BACKGROUND TO THE PROBLEM AND AN APPLICATION OF THE PARETIAN DECISION MODEL. *Environment Canada, Edmonton (Alberta), Northern Forest Research Centre Information Rept. NOR-S-69, 74p., March 1973. 12 refs.*

The proposed revision of the ambient air quality standards for sulfur dioxide for Alberta by the Alberta Department of the Environment is analyzed using Paretian Environmental Analysis (PEA). Processing of sour natural gas is the source of nearly all SO2 emissions, in 1973 totalling 500,000 long tons. There is controversy over methods and standards for SO2 emissions control based on the value of benefits derived from the high costs of improving sulfur recovery. The analysis presented formulates a set of functions expressing the net benefits to each major party affected by a decision on SO2 standards. The formulation illustrates the informational gaps for fully rational decision-making on the issue. It provides a method to test the sensitivity of the decision on the accuracy of data and the politcal weights of the participants. (Author abstract modified)

45895 **APTIC NO. [illegible]**

Kurchatova, G., M. Teneva, and Z. Modeva

DIURNAL VARIATION OF THE DUST AND LEAD AEROSOL CONCENTRATIONS IN THE SOFIA (BULGARIA) AREA. *(Izucheniye sutochnogo khoda kontsentratsii pyli i aerozolcy svintsa v rayone Sofii). Text in Russian. Khidrol. Meteorol. (Sofia), 22(3):93-96, 1973. 25 refs.*

The daily variations of the dust and lead aerosol concentrations were studied at a sampling station on the outskirts of Sofia, Bulgaria along an interstate highway. The dust concentrations were lowest between 11 pm and 5 am, and highest between 8 am and 11 am, averaging 172 micrograms/cu m. The lead concentrations were highest between 8 am and 5 pm, and lowest between 11 am to 8 am, averaging 0.0021 micrograms/cu m. The good correlation between the course of the lead concentrations and the traffic density indicates that a lead smelter 12 km from the sampling station has little effect on the overall lead concentration. The dust and lead concentrations were lowest at minimum temperature and maximum atmospheric stability between 2 am and 5 am.

45896 **APTIC NO. 68492**

Ako Municipal Government (Japan)

DATA FOR ENVIRONMENTAL POLLUTION IN AKO CITY (NO. 4), 1973. *(Ako-shi no kogai shiryo (dai 4-go) Showa 48-nendo). Text in Japanese. 134p., Dec. 1973.*

Ako was a small, clean township, historically important but not industrially important. It was made into a city in 1951 and by 1963 grew twice as large in area by joining part of nearby villages and began to industrialize heavily. The fuel oil consumption increased by 400% between 1966 and 1972, and now about 2150 plants of various industries are operating. The very rapid destruction of the environment, air, water, noise, vibration, and odor pollutions have irritated and alarmed the citizens greatly, and city ordinances for environmental protection were belatedly issued in 1971; the city is now making an effort in environmental improvements. The city is surrounded by relatively low hills of 200-400 m, and the distance from the shore to the hills is 2-4 km, to the ridges, 3-5 km. This topographical characteristic is the cause for a complicated pollution pattern. Air dispersion near the ground surface is very poor and the potential for smog is extremely high. Air pollution is monitored at six locations for settling particles, at two places for suspended particulates, at 33 locations for sulfur oxides, and at one location for nitrogen oxides. The annual sulfur dioxide averages were 0.18 mg by the lead dioxide method or 0.027 ppm by electroconductivity in 1972; the average for settling particles was 4.23 ton/sq km/mo for suspended particulates, 28 microgram/cu m; and for nitrogen dioxide was 0.016 ppm. However, the averages are deceptively low; the maximum measurements in Ako are one of the highest in the entire Hyogo Prefecture.

1971

45897 **APTIC NO. 69144**

Heaney, Robert J.

DISTRIBUTION OF TRACE ELEMENTS IN THE VICINITY OF AN INTEGRATED PRIMARY COPPER PRODUCTION FACILITY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 31p., 1971. 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-135.)*

Sulfur oxide and particulate composition data are presented from air quality monitoring activities in the vicinity of an integrated primary copper production facility during the period 1959-1970. The average long term sulfur oxide concentrations ranged from 0.30-0.58 mg sulfur trioxide/day/sq dm. Suspended particulate levels of lead and copper ranged from 0.2-3.2 and from 0.3-0.8 micrograms/cu m, respectively. Settleable particulates ranged from 5-26 tons/sq mi/month and contained zinc, molybdenum, and selenium. Fluorides were also measured and showed significant decreases as compared to slight decreases for copper and sulfur oxides. Sulfur oxides and fluorides were much more subject to seasonal meteorological variations than particulate material constituents. An inverse relationship was observed between suspended particulates and settleable dust, with the former being higher during the windier months and the latter during the more stable inversion months. Concentrations were clearly related to distance from the source, and analysis of statistical distributions showed that both gaseous and particulate matter-related constituents were approximately log-normally distributed.

45898 **APTIC NO. 68331**

Thompson, C. Ray

MEASUREMENT OF TOTAL OXIDANT LEVELS AT RIVERSIDE COMMUNITY HOSPITAL. *Arch. Environ. Health, vol. 22:514-515, April 1971. 3 refs.*

Total oxidant levels were measured inside the Riverside Community Hospital. They were 1/2 to 2/3 the levels in the ambient air outside the building. The high oxidant levels in the area could affect the health of patients. Generally, within air-conditioned buildings, total oxidant levels were about 1/2 those outside. Activated charcoal filters were effective in reducing ozone levels to near 0. They also removed peroxyacyl nitrates and nitrogen dioxide. The use of activated charcoal filters in hospitals could aid patient comfort and recovery.

1965

45899 **APTIC NO. 62278**

Rancitelli, L. A., J. A. Cooper, and R. W. Perkins

MULTIELEMENT CHARACTERIZATION OF ATMOSPHERIC AEROSOLS BY INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS AND X-RAY FLUORESCENCE ANALYSIS. *Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1)-1830, IAEA-SM-175/24, Conf-730839--1, 23 p.*

NTIS: BNWL-SA-4671

The measurement of some 40 trace elements, including all those designated as pollutants in air filters, water samples, biota, and other environmental materials by rapid analytical techniques based on X-ray fluorescence is reviewed. Nord and Thule, Greenland had the lowest concentrations and presumably the lowest dust burden, while the highest concentrations were observed in Santiago, Chile; Lima, Peru; and New York City. The normalization of the air concentrations of elements from known or suspected anthropogenic sources such as vanadium, manganese, cobalt, zinc, arsenic, lead, and selenium to elements of terrestrial origin such as aluminum, scandium, or iron provides an index of the local pollution by these elements. This approach showed that Pb is increased over natural levels by several orders of magnitude at all stations except Mauna Loa, Hawaii, Thule, Greenland, and San Juan, Puerto Rico. Abnormally high concentrations of V were noted in New York City; Miami, Fla., and Balboa, Panama Canal Zone. The sampling location at Balboa was close to the shipping lanes and presumably the high V concentration can be attributed to the emissions from ship stacks.

ATMOSPHERIC INTERACTION

1974

45900 **APTIC NO. 69119**

Alkezweeny, A. J., D. W. Glover, R. N. Lee, J. W. Sloot, and M. A. Wolf

MEASURED CHROMIUM DISTRIBUTIONS RESULTING FROM COOLING TOWER DRIFT. *Preprint, Maryland Univ., College Park, 22p., 1974. 6 refs. (Presented at the Cooling Tower Environment Symposium, College Park, Md., March 4-6, 1974.)*

NTIS: BNWL-SA-4919, Conf-740302-1

Useful data concerning the distribution of drift from a mechanical draft cooling tower were derived from field measurements despite the nonideal conditions which were encountered. Observed chromium fluxes ranged from about 1 mg/sq m/hr at a distance of 30 m from the tower to about 1% of that value at 1 km. Air concentrations of chromium were fairly constant at about 50 ng/cu m to a distance of about 200 m downwind of the tower, apparently due to thorough mixing in the wake of the tower and to a lack of lateral dilution of the effluent from a crosswind line source. A simplified droplet trajectory model estimated drift deposition flux within an order of magnitude. Neither that model nor the experimental data were sufficiently detailed to permit definitive assessment of cooling tower drift. The proper assessment of cooling tower drift deposition for general application would require a comprehensive investigation centered on an isolated cooling tower whose operational characteristics are well-defined and subject to control. Documentation of the drift droplet spectrum and properties of the buoyant plume and the adjacent atmosphere are essential to such an effort. (Author conclusions modified)

45901 **APTIC NO. 69027**

Ando, Masaji

ABNORMAL CLIMATES OF RECENT YEARS. *(Kinnen no ijo tenko ni tsuite). Text in Japanese. Denryoku to Kisho (Denryoku Kisho Renrakukai Iho) Q. Power Weather Coord. Comm., vol. 21:1-11, June 1974. 10 refs.*

One of the reasons for the abnormal climates in recent years may be sumicron aerosols emitted by various human activities. Dusts and smoke particles come from underdeveloped countries where burning of the fields is one method of cultivation as well as from highly industrialized countries. These suspended particulates cause the ring around the sun, and the effects are even greater for high latitude countries where the sunrays go through deeper air strata. According to graphic studies of direct sunrays received by various parts of Siberia, the amount of sunray has been declining since 1940 in a slow curve. According to another study, the icebergs formed in the Arctic Sea have been on the increase generally. Because any temperature drop in the Arctic area has an accelerated effect, when a 1% sunshine decrease occurs, the temperature drops by 5 C, and a 1.5% decrease means a drop of 9 C. This extends glaciers from 8 to 18 degrees southward in latitude. On the other hand, the increase of carbon dioxide in the air has had a reverse effect. Carbon dioxide lets the sunray short waves go through and absorbs the long wave earth radiation heat. Therefore the increase of CO2 in the atmosphere retains heat around the earth and increases the sea water temperature, which decreases the dissolving of CO2 in water. Part of the CO2 in water is also emitted into the atmosphere. These and a number of complex conditions are contributory to the abnormal climates.

45902 **APTIC NO. 68669**

Asakura, Kazuo and Hiroshi Shikata

A PLUME MODEL APPLICABLE TO UNSTATIONARY METEOROLOGICAL CONDITIONS. *(Kisho joken ga jikan henka suru baai no baien kakusan keisan shuho purumu moderu.) Text in Japanese. Denryoku Chuo Kenkyusho Gijutsu Daiichi Kenkyusho Hokoku (Tech. Lab. Central Res. Inst. (No. 1) Electric Power Ind., Rept.), no. 73076, 20p., April 1974. 5 refs.*

A calculation method for smoke diffusion under unstationary meteorological conditions such as the case of land and sea breeze alternation and inversion breakup was developed by expanding diffusion equations based on plume models for stationary meteorological conditions (wind direction, wind velocity and atmospheric stability). The smoke diffusion under unstationary meteorological conditions, plume model, determination of diffusion parameters, and calculation method for ground level concentration are described. An example of the calculation method for 1-hour values is described. The characteristics and applicable range of this method are discussed, and calculation examples are given. The effects of hourly variation in meteorological conditions were well expressed.

45903 **APTIC NO. 68819**

Batten, E. S.

THE ATMOSPHERIC RESPONSE TO A STRATOSPHERIC DUST CLOUD AS SIMULATED BY A GENERAL CIRCULATION MODEL. *Rand Corp., Santa Monica, Calif., Defense Advanced Research Projects Agency Contract DAHC15 73 C 0181, ARPA Order 189-1, 3P10 Distributed Information Systems, Rand Rept. R-1324-ARPA, 22p., March 1974. 20 refs.*

NTIS, DDC: AD780679

The Rand version of the Mintz-Arakawa General Circulation model was used to investigate the initial atmospheric response to a stratospheric dust cloud spread uniformly in a zone between 25 N and 75 N. In the experiment discussed, the dust cloud was assumed to consist of particles 2 micron in diameter or smaller, totaling 0.04 cu km. This volume of dust is equal to the estimated volume ejected into the stratosphere by the 1883 eruption of Krakatoa. The stratospheric dust cloud is assumed to perturb the atmosphere by attenuating the solar radiation and by stimulating the precipitation process. The model was integrated for a simulated period of 60 days corresponding to the months of January and February. The results were compared with a control experiment starting from the same initial conditions and simulating the same period. The following anomalies in temperature, precipitation, and atmospheric circulation were noted: In the atmosphere and at the surface beneath the dust cloud, the temperature decreased 2-3 C and the normal wintertime land/ocean temperature contrasts were increased. Despite the specification of a 20% increase in the rate of precipitation, the total precipitation at latitudes affected by the cloud did not change significantly. However, the latitudinal distribution of precipitation was modified. The precipitation at high latitudes (46-74 deg N) actually decreased by about 20%, while at low latitudes (26-46 deg N) the precipitation increased by 23%. Although some of the anomalous precipitation patterns can be explained by anomalies in the evaporation, most are a direct result of changes in the circulation and moisture flux. The joint effects of decreasing the solar radiation and increasing the precipitation resulted in a weakening of the midlatitude Ferrel circulations, a decrease in the baroclinicity (and therefore in northward eddy transports of moisture) at high latitudes, and an increase in the baroclinicity (and therefore northward eddy transports) at low latitudes.

45904 **APTIC NO. 68631**

Beran, D. W., B. C. Willmarth, F. C. Carsey, and F. F. Hall, Jr.

AN ACOUSTIC DOPPLER WIND MEASURING SYSTEM. *J. Acoust. Soc. Amer., 55(2):334-338, Feb. 1974. 15 refs.*

A system using the Doppler shift of audible sound waves to measure atmospheric winds to heights of 1 km above the surface is described. Planned application of the device at a commercial airport required extensive transducer and antenna shielding to reduce the effect of ambient noise. Comparisons of winds measured by both the acoustic Doppler system and standard radiosondes indicated that high accuracy and resolution can be achieved and that the wind profiles can be continually monitored with relatively simple ground-based equipment. (Author abstract)

45905 **APTIC NO. 69069**

Davidson, C. I., J. J. Huntzicker, and S. K. Friedlander

THE FLOW OF TRACE ELEMENTS THROUGH THE LOS ANGELES AREA: EFFECT OF NON-URBAN AREAS. *Am. Chem. Soc., Div. Environ. Chem., Prepr., 14(1):251-253, 1974. 9 refs. (Presented at the American Chemical Society, Division of Environmental Chemistry, National Meeting, 167th, Los Angeles, Calif., April 1-5, 1974, Paper 47.)*

The mass flows of lead, zinc, cadmium, and nickel to coastal water, mountains, and deserts surrounding the Los Angeles basin were measured to determine the effect of Los Angeles as a pollutant source. Atmospheric routes were liberally defined to include fallout, rainout-washout, and runoff. The primary source of contaminants in runoff is atmospheric fallout. The mass flux in metric ton/yr to the coastal waters from fallout is 140 for lead, 60 for Zn, 14 for Ni, and 0.9 for Cd. Large reductions in Pb in the input to the coastal waters can be achieved only when atmospheric routes are controlled. No firm statement can be made on the long range transport of Zn, Cd, and Ni because there are local sources for these elements in the remote regions.

45906 **APTIC NO. 68980**

Davis, D. D., G. Smith, and G. Klauber

TRACE GAS ANALYSIS OF POWER PLANT PLUMES VIA AIRCRAFT MEASUREMENTS: O3, NOX, AND SO2 CHEMISTRY. *Preprint, National Science Foundation, Washington, D. C., Research Applied to National*

Needs Program, 13p., 1974. 10 refs. (Presented at the Trace Contaminants Conference, 2nd Annual, Oak Ridge, Tenn., Aug. 1974.)

Results from field studies using an airborne sampling platform and laboratory kinetic investigations to determine the extent to which nitrogen oxide and sulfur dioxide chemistry occurs in the gaseous plume of an isolated 1000 MW power plans as a function of distance are reported. The power plant plume has a very significant effect on ambient air ozone levels which at 60 ppb are totally depleted within the plume width out to distances of 5 km. Beyond this distance ozone continues to be totally depleted in portions of the plume. Good correlations are found between the SO2 profiles and positive or negative O3 peaks, indicating that the chemistry taking place is that representative of the plume. Measurements of nitric oxide concentrations 2.4 km downwind from the stack show average values of 1.4 ppm and suggest along with kinetic, data that the reaction of O3 with NO is of major importance in the O3 depletion. A mechanism involving hydroxyl free radicals is also postulated to be of importance in defining the chemistry of power plant plumes during summertime conditions.

45907 **APTIC NO. 69020**

Eagan, Richard C., Peter V. Hobbs, and Lawrence F. Radke

PARTICLE EMISSIONS FROM A LARGE KRAFT PAPER MILL AND THEIR EFFECTS ON THE MICROSTRUCTURE OF WARM CLOUDS. *J. Appl. Meteorol., 13(5):535-552, Aug. 1974. 24 refs.*

Airborne measurements of cloud condensation nuclei (CCN), total particle counts, the size distribution of particles, and the microstructure of warm clouds were made in the vicinity of a large kraft pulp and paper mill. The plume of CCN and total particles from the mill was well-defined at distances up to 40 km downwind, and the concentrations of these particles reached values which exceeded those in the ambient air by a factor of about four. A large peak in the concentrations of CCN was measured in the plume at a distance downwind of the mill corresponding to a travel time of about 4 hr. The total particle count in the plume peaked after about 2 hr of travel time downwind. The particles in the plume were measured over the size range 0.3 to 8 micron; their concentrations were much higher than in the ambient air, particularly those with diameters less than 1 micron. At points downwind in the plume corresponding to travel times greater than or approximately equal to 6 min, a secondary peak appeared in the concentration of particles with diameters just in excess of 0.3 micron and it persisted for travel times up to about 4 hr. The rates of production of CCN and particles greater than 0.3 micron in diameter in the plume were estimated to be about 0.05/cu cm/sec. This may be due to gas-to-particle conversions. Clouds that form in the plume from the paper mill had a much broader spectrum of droplet sizes than those which formed in the ambient air. Since the former clouds contain a significant number of droplets with diameters greater than 30 micron, as well as a large number of smaller droplets, precipitable drops should form in them very efficiently by the coalescence mechanism. These observations support the suggestion that the effluents from paper mills are probably responsible for the anomalously high annual precipitation amounts which have occurred in the vicinity of such mills in the state of Washington in recent years. (Author abstract modified)

45908 **APTIC NO. 68630**

Hagles, Thomas W. and Lawrence C. Kohlenstein

A COOLING TOWER VISIBLE PLUME PREDICTION MODEL BASED ON MEASUREMENTS. *Preprint, American Geophysical Union, 15p., 1974. 6 refs. (Presented at the American Geophysical Union, Annual Meeting, 55th, Washington, D. C., April 1974.)*

A mathematical model was developed for predicting the length and centerline height of the visible portion of the plume from a mechanical draft cooling tower. Plume centerline trajectory was predicted using a modified form of Briggs equation, in which the entrainment rate was varied such that the resulting plume trajectory agreed with measurements of plume height from an existing tower. The average temperature and water concentration in the rising plume was calculated by a method based on the work of Hanna. The assumption was made that the relative humidity at the plume centerline was higher than the average relative humidity in the plume. The plume was assumed to be visible when saturation conditions existed at the plume centerline; the ratio of centerline relative humidity to average relative humidity was varied such that the length of the visible plume agreed with measurements of plume length from an existing tower. Model predictions agreed well with measurements of visible plume length. (Author abstract)

45909 **APTIC NO. 68968**

Fujii, Shoichi, Osamu Minamino, and Masato Nakajima

ESTIMATION AND MEASUREMENT OF SUSPENDED DUST CONCENTRATION CAUSED BY AUTOMOBILES. *(Jidosha soko ni tomonau fuyu funjin osendo no suitei oyobi jissoku). Text in Japanese. Preprint, Japan Society of Architecture, p. 159-160, 1974. 1 ref. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4080.)*

The amounts of suspended particulates produced by moving automobiles measured in a tunnel were 0.15-0.30 mg/m-veh (average 0.26 mg/m-veh) for compact cars and 0.65-0.80 mg/m-veh (average 0.72 mg/m-veh) for full-size cars. The suspended particulate concentrations were also measured at two points on a roadside, and the correction coefficients were calculated by assuming a mixed dispersion layer. The measured value and the calculated value by dispersion equation showed a significant correlation. To investigate the dispersion of suspended particulates produced on a road, the horizontal distribution was measured up to a distance of 70 m. The measured values were compared with the calculated values obtained by substituting the suspended particulate concentration in the mixed dispersion layer into Sutton's dispersion equation. The calculated values were markedly higher in the vicinity of the road, indicating the inadequacy of Sutton's equation for the estimation of suspended particulates concentration. The effects of wind direction and velocity on dispersion were investigated and indicated that the dispersion was greatly affected by these factors.

45910 **APTIC NO. 69054**

Fukuoka, Saburo

METEOROLOGICAL CONDITIONS INDUCING PHOTOCHEMICAL SMOG. *(Kokagaku sumoggu no kisho joken). Text in Japanese. Ao to Midori (Blue Green), 3(8):39-50, Aug. 1974.*

Meteorological conditions involved in secondary air pollution by photochemical smog are different from those in primary pollution in that strength of ultraviolet light of a specific wavelength and temperature are important conditions to be considered. Photochemical smog is characterized by a tendency in which the peak of the pollutant concentration appears at and around midday and in the summer season. The concentration of oxidants increases with an increase in the amount of sunshine. The concentration of oxidants changes at the level of more than 60 cal/sq cm/hr of sunshine. Thus a temperature difference between land and sea widens when the amount of sunshine is intensified, with a sea breeze developing to dilute and diffuse oxidants. High levels of oxidants occur even in the winter season in Los Angeles, whereas in Tokyo high levels occur only from June to August. One reason for this is the large temperature difference between the two cities. The frequency of the high concentration of oxidants is markedly reduced when the temperature maximum of the whole day is less than 25 C in Tokyo and less than 13 C in Los Angeles (even in the presence of hydrocarbons in high concentration in the morning).

45911 APTIC NO. 68518

Funakoshi, Teiji

VARIATIONS IN SOLAR RADIATION, SUNSHINE QUANTITY, AND VISIBILITY (REPORT 1). *Text in Japanese. Kishocho Gijutsu Shiryo: Taiki Osen Kisho Yoho Shiryo (Air Pollut. Weather Forecasting Data), 15(2):54, Feb. 1974.*

The weather factors of the Nara Basin between 1961 and 1970 were examined in relation to the degree of air pollution. The yearly changes in the quantity of sun rays, sunshine, and visibility are discussed. The total sun ray quantity changes over the years were examined by regression curves and the reduction rate and gradient coefficient were obtained. The total solar radiation decreased by about 2000 in 10 years. The number of months with higher elevations of the sun decreased more than 20% in recent years; the changes between 1969-1970 in winter and the drop between 1961 and 1963 summers were notable. The average daily solar radiation quantities were compared by the year, and an average of 23% decrease was calculated for summer months. Comparing sunny days of 1961 and 1970 with the same sun elevation and distance, the cumulative sun ray quantity of the latter was 15% less than that of the former. Seasonally, the 9 am solar radiation decreased by 3% in winter and by 15% in summer; that of 3 pm decreased by 15% in winter and by 7% in summmer. The amount of cumulative sunshine does not show such a drastic decline, but the total annual sunshine in 10 years decreased by about 24 hours. The decline is especially notable in the winter at noon. The frequency of less than 2 km visibility is definitely increasing.

45912 APTIC NO. 68972

Furuse, Toshi

STUDIES ON POLLUTANT DIFFUSION IN CITY STREETS. (1) AN EXPERIMENTAL BASIC MODEL. *(Shigaichi naibu no osenshitsu kakusan seijo ni kansuru kenkyu. (Sono 1) Kihonteki mokei ni horu jikken). Text in Japanese. Preprint, Japan Society of Architecture, Tokyo, p. 167-168, 1974. 2 refs. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4084.)*

Wind tunnel experiments were conducted to study the influence of city street buildings on pollutant diffusion characteristics. To simulate air currents along city streets, blocks (cross-section, 30 sq mm; width, 100 mm) were placed 200 mm apart on the floor of the wind tunnel, in front of the configurations which served as building models. Tracer gas (ethane) was emitted as the pollutant, and wind velocity profiles and concentration isopleths were determined.

45913 APTIC NO. 68899

Griffiths, John F. and M. Joan Griffiths

BIBLIOGRAPHY OF THE URBAN MODIFICATION OF THE ATMOSPHERIC AND HYDROLOGIC ENVIRONMENT. *Texas A and M Univ., Meteorology Dept., College Station, NOAA TM EDS 21, Rept. NOAA-74032231, p. 1-69, 92, Feb. 1974. 487 refs.*

NTIS: COM-74-10962

A bibliography of the urban modification of the atmospheric environment was compiled. It consists of 487 citations in these categories: city, cloud, cooling power, dust and nuclei, electricity and ions, humidity, light, models, pollution, precipitation, radiation, temperature, visibility, and wind. Only those references to city climates that actually contain comparisons with adjacent rural climates are included. The change under city influence is stressed.

45914 APTIC NO. 68974

Hayakawa, Kazuya, Takeshi Kubo, and Mitsutoshi Goto

FUNDAMENTAL STUDIES OF AIR POLLUTION EFFECTS ON ENVIRONMENTAL CAPACITY. (2) HEAT STRUCTURE OF THE URBAN ATMOSPHERE. *(Taiki osen no kankyo yoryo ni kansuru kisoteki kenkyu. (Sono 2) Toshi taiki no netsu kozo). Text in Japanese. Preprint, Japan Society of Architecture, Tokyo, p. 171-172, 1974. 7 refs. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4086.)*

In January 1974, infrared camera was used to take heat image photographs of the ground over Tokyo from an airplane, once at sunrise and once at noon. The actual ground temperatures were measured at several observation points for correlation. A grid (mesh size, 1 km sq) was superimposed on a map of metropolitan Tokyo, and heat data were calculated for each square. The amount of heat expelled into the atmosphere from each 1 km sq unit was determined. In general, heat from winter sunshine was about 3.4 times the heat expelled in the city. However, the maximum amount of heat expelled in the city per mesh was about 9 times the heat from winter sunshine.

45915 APTIC NO. 68976

Hayakawa, Kazuya, Takeshi Kubo, and Yukio Sano

FUNDAMENTAL STUDIES OF AIR POLLUTION EFFECTS ON ENVIRONMENTAL CAPACITY. (4) AIR POLLUTION CONCENTRATION SIMULATION. *(Taiki osen no kankyo yoryo ni kansuru kisoteki kenkyu. (Sono 4) Taiki osen nodo no shimyureshon). Text in Japanese. Preprint, Japan Society of Architecture, Tokyo, p. 175-176, 1974. 2 refs. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4088.)*

Simulation of air pollution conditions with respect to concentration of sulfur oxides was conducted for metropolitan Tokyo. Equations were formulated, taking into account wind direction and velocity, and manpower contribution to pollutant emissions with respect to time. Data for 1972 from a representative pollution monitoring station was analyzed, and a day in 1973 which closely matched the average monthly concentration for 1972 was selected. The meteorological conditions for this day were used to calculate the sulfur oxide concentrations. The calculated and observed concentrations showed a more or less linear correlation, but the calculated values were higher.

45916 APTIC NO. 68787

Hayashi, M., O. Yokoyama, and M. Gamo

A CASE STUDY OF THE DEVELOPING AND DECAYING PROCESS OF THE NOCTURNAL TEMPERATURE INVERSION LAYER IN URBAN AREA. *(Toshiiki ni okeru seiya gyakutenso no seisei shometsu katei). Text in Japanese. Kogai Hakus Shoho (Pollution Control), 9(4):36-43, July 1974. 12 refs.*

The vertical temperature distribution up to 500 m altitude was measured by a thermistor thermometer mounted on a captive balloon over Tokyo from November 29 (1500 Japan Standard Time) to November 30 (1100 JST) in order to study the developing and decaying processes of the nocturnal temperature inversion in an urban area. The observation site was located on the north part of Tokyo. The vertical distribution of heat flux was obtained by mathematical integration of the energy equation. Winds were weak throughout the experiment, and the contribution by advection was neglected. Heat flux was obtained from an equation involving potential temperature and the height at which the temperature change due to the divergence of heat flux disappears. Development of the inversion was slow prior to midnight due to alto-cumulus depression of the long wave emission from the earth's surface; after midnight the sky cleared up, and the inversion developed rapidly. The observed structure of the inversion consisted of three layers: a lower inversion layer of equi-temperature, a higher layer of weak stable air above the first, and a thermocline between these two layers. The first inversion layer developed upward with the cooling of the earth's surface at an ascending speed of about 13 m/hr. The eddy thermal conductivity defined by the ratio of heat flux and mean potential temperature gradient decreased rapidly with height in the cooling process. The layered structure of the nocturnal inversion began to break from the bottom with the warming of the earth s surface due to insolation. The height or the thickness of the thermal boundary layer increased with the square of the cumulative insolation for the heating process, and during the heating process the upward heat flux was recognized in spite of the positive potential temperature gradient.

45917 **APTIC NO. 68754**

Hemmi, T. and E. R. Reiter

POLLUTION TRANSPORT BY CUMULUS CLOUDS. *Preprint, National Science Foundation-RANN, Washington, D. C., 8p., 1974 (?). 12 refs. (Presented at the Trace Contaminants Conference, 2nd Annual, Oak Ridge, Tenn.)*

A preliminary numerical study of the effects of the physical characteristics of cumulus clouds on the concentration of air pollutants in rain water is presented, with wet removal processes being expanded by applying cloud census data. The following results are obtained from the calculations: the higher the cloud, the larger the updraft velocity and liquid water content; the total liquid water condensed per unit area of cloud is larger for higher clouds; the relative concentration of pollutant decreases rapidly with height in the case of larger values of scavenging coefficient (in the case of small scavenging coefficient values, the concentration of pollutant in cloud air is significant even in the top portion of the cloud); the time required for the pollutant to be scavenged by cloud water is longer under inefficient scavenging processes; and the shapes of the curves for average concentration of pollutant in cloud water versus total liquid water condensed in the clouds are similar to those for average concentration of pollutant in cloud water versus cloud height for different values of scavenging coefficients.

45918 **APTIC NO. 69160**

Hofmann, D. J., J. M. Rosen, and T. J. Pepin

STRATOSPHERIC AEROSOL MEASUREMENTS I: TIME VARIATIONS AT NORTHERN MIDLATITUDES. *Wyoming Univ., Laramie, Dept. of Physics and Astronomy, Office of Naval Research Contract N00014-70-A-0266-005, Rept. GM-21, 42p., Aug. 1974. 23 refs.*

Monthly balloon soundings were conducted from a Laramie, Wyo. station during 1972-1973. A simple seasonal variation in the total stratospheric aerosol loading below 20 km altitude dominates the temporal variation at Laramie, resulting in a maximum in winter and a maximum in summer. A high correlation with tropopause height is observed. The seasonal variation appears to be superimposed on a long-term variation, the nature of which is unknown. Above 20 km, no seasonal variation is evident, and the natural aerosol production processes are nearly in equilibrium with loss processes. (Author abstract modified)

45919 **APTIC NO. 69872**

Huntzicker, James J.

THE PRODUCTION RATE OF SULFATE AEROSOL IN THE STRATOSPHERE: ENVIRONMENTAL IMPLICATIONS OF A STRATOSPHERIC AIRCRAFT FLEET. *Am. Chem. Soc., Div. Environ. Chem., Prepr., 14(1):305-309, 1974. 13 refs. (Presented at the American Chemical Society, Division of Environmental Chemistry, National Meeting, 167th, Los Angeles, Calif., April 1-5, 1974, Paper 58.)*

The production rate of sulfate aerosol in the stratosphere was estimated and the environmental implications of a stratospheric aircraft fleet determined. It was assumed that during quiescent periods the sulfate layer is in a steady state with respect to formation and removal and that the source of the sulfur is tropical sulfur dioxide upwelling into the stratosphere. The decrease of SO2 as the equator is approached from the north indicates that tropical SO2 arises from transport from the north temperate region. The steady state increase of stratospheric sulfate in the northern hemisphere was calculated assuming that all SST flights are in the northern hemisphere and all emissions are in the 13-23 km band. The percent increase in aerosol loading as a function of fuel (0.08 weight percent S), which is burned above the tropopause, is plotted. A steady state increase in aerosol loading will change the global albedo and bring about possible climatic alteration.

45920 **APTIC NO. 69868**

Huntziker, J. J., C. I. Davidson, and S. K. Friedlander

THE FLOW OF TRACE ELEMENTS THROUGH THE LOS ANGELES BASIN: ZN, CD, AND NI. *Am. Chem. Soc., Div. Environ. Chem., Prepr., 14(1):245-250, 1974. 14 refs. (Presented at the American Chemical Society, Division of Environmental Chemistry, National Meeting, 167th, Los Angeles, Calif., April 1-5, Paper 46.)*

The concentrations and flow of trace amounts of zinc, cadmium, and nickel through the Los Angeles Basin are described. The two major sources of atmospheric Zn in the Los Angeles area are tire dust (1180 kg/day) and metallurgical emissions (860 kg/day). Other automotive sources account for 150 kg/day. There are three environmental pathways: near fallout (1050 kg/day + or - 500; far fallout 630 kg/day + or - 370; and airborne 570 kg/day + or - 470. The primary source of airborne Ni is probably the combustion of fuel oil by power plants which generate 13 metric tons/day of particulate emissions. About 90 kg of Ni are deposited daily over the basin. No emissions data are available for Cd. Based on fallout measurements a total Cd fallout rate of 5 kg/day is obtained.

45921 **APTIC NO. 68494**

Ichikawa, Kiyomi

BASIC INVESTIGATIONS FOR PHOTOCHEMICAL SMOG FORECASTING. *(Kokagaku suumoggu yoho ni kiso choan). Text in Japanese. Kishocho Gijutsu Shiryo: Taiki Osen Kisho Yoho Shiryo (Air Pollut. Weather Forecasting Data), 15(2):58-59, Feb. 1974.*

Using data for 99 smog days in Osaka between June and Oct. 1972, the relationship between the weather and photochemical smogs and a prediction method are discussed. The temperature and sunshine, the ground breeze and the upper atmosphere, the atmospheric stability, the rain precipitation, the distribution of 850 mb (pressure), are briefly examined, and thhe prediction model is presented by a diagram.

45922 **APTIC NO. 68629**

Ingram, Gregory K. and Gary R. Fauth

TASSIM: A TRANSPORTATION AND AIR SHED SIMULATION MODEL, VOL. 1, CASE STUDY OF THE BOSTON REGION (FINAL REPORT). *Harvard Univ., Cambridge, Mass., Dept. of Transportation Contract DOT-OS-30099, Rept. DOT-OS-30099-5, 105p., May 1974. 35 refs.*

NTIS: PB 232933

The TASSIM (Transportation and Air Shed Simulation Model) has the capability to simulate concentrations of carbon monoxide, hydrocarbons, oxides of nitrogen, sulfur dioxide, and particulate matter in as many as 200 distinct zones within a metropolitan area. The conceptual framework of the model consists of three major components: a transportation submodel, an emission submodel, and an air diffusion submodel. The model can be used to analyze the air quality effects of transportation policies. The model is spatially disaggregated and is compatible with data sources available in many metropolitan areas. This volume briefly describes the structure of the model and analyzes several model applications that simulate for Boston the air quality effects of transportation control land use and stationary source policies. The transportation control policies are evaluated in a cost effectiveness framework. Possible extensions of the model are considered, and the model s computational aspects are outlined. (Author abstract modified)

45923 **APTIC NO. 68979**

Irie, Takehisa and Susumu Yoshizawa

CHARACTERISTICS OF POLLUTION DIFFUSION IN U-TYPE SPACE (3). STUDIES ON THE THREE-DIMENSIONAL AIR FLOW SURROUNDING BUILDINGS ON CITY STREETS AND ITS TURBULENT FLOW DIFFUSION (13). *(Boko jo kukannai no osen kakusan no seijo ni tsuite (3). Shigaichi ni okeru kenchikubutsu shuhen kiryu no rittaiteki kozo to sono ranryu kakussan ni kansuru kenkyu (sono 13)). Text in Japanese. Preprint, Japan Society of Architecture, Tokyo, p. 181-182, 1974. 3 refs. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4091.)*

Pollution diffusion in a U-shaped space was investigated, where the width (1) was constant at 100 mm, and the depth (d) was varied at 50, 100, 150, and 200 mm. Experimental details are presented in previous reports. Diffusion characteristics on the four different cross-sections were compared. Observations were made on the formation of a stagnant region at the bottom of the U, which occurs when d/1 is greater than 1. When d is large, pollution diffusion in the U-type space depends on boundary conditions determined by the cross-sectional shape, wind velocity, tracer concentration, amount of material expelled into the air, and the diffusion constant.

45924 **APTIC NO. 69146**

Isyumov, N., T. Jandali, and A. G. Davenport

MODEL STUDIES AND THE PREDICTION OF FULL SCALE LEVELS OF STACK GAS CONCENTRATION. *Preprint, Air Pollution Control Assoc. Pittsburgh, Pa., 35p., 1974. 18 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-162.)*

The scaling requirements and experimental procedures for modeling the diffusion of stack plumes during conditions of neutral atmospheric stability are presented. Wind during neutral conditions is modeled by a turbulent boundary layer developed naturally over a long stretch of upstream terrain. Both the inertia and bouyancy properties of the plume are simulated; the latter is achieved by using an air helium mixture. The helium is also used as a tracer gas for measurements of model concentrations resulting from the stack operation. Some illustrative experimental measurements are presented. The methodology developed at the Boundary Layer Wind Tunnel Laboratory for providing predictions of full-scale stack gas concentrations is summarized. In this approach, wind tunnel derived measurements of stack gas concentrations at particular downwind locations, wind speeds, wind directions, and power plant operating conditions can be combined with the statistical description of the local wind climate to arrive at predictions of the excedance of particular full-scale sulfur dioxide concentrations. Ground level SO2 concentrations predicted to be exceeded during particular proportions of time are compared with data derived from analysis of full-scale SO2 observations. (Author abstract)

45925 **APTIC NO. 68499**

Kato, Shinjiro

BASIC INVESTIGATION FOR AIR POLLUTION WEATHERS - OXIDANTS IN SPRING. *(Taiki osen kisho no kiso chosa - shunki no okishidanto). Text in Japanese. Kishocho Gijutsu Shiryo: Taiki Osen Kisho Yoho Shiryo (Air Pollut. Weather Forecasting Data), 15(2):62- 63, Feb. 1974.*

The continuous measurement of the oxidant (Ox) level in the greater Osaka vicinity was initiated on June 10, 1971. The measurement of Ox for the period between April and the beginning of the rainy season was taken for the first time in 1972; therefore, high Ox days of this period were given a close examination. More than 0.11 ppm Ox concentration before noon at more than two locations on the same day was considered high and used as part of the data, excluding days of rain and strong winds, since high Ox concentrations on such days were regarded as results of an equipment disorder. The records of 20 days were examined. Three patterns were recognized by the time of the appearances of maximum concentrations: the type I maximum concentration appeared between 9 and 11 am; the type II maximum appeared between noon and 2 pm; and the type III maximum appeared between 3 and 5 pm. Seven days belonged to type I; eight to type II, and five to type III. The days of the temperature difference of between 0 and 2 C at Hoenzaka and Mount Ikoma all belonged to type I. Four cases reached 10 ppm by 9 am. Five cases of temperature differences of 3-4 C belonged to type III, and eight to type II. When the temperature difference was more than 9 C, there was no case of high Ox concentration.

45926 **APTIC NO. 69012**

Kato, Shinjiro

HIGH SO2 POLLUTION ON SPECIFIC DAYS - ANALYSIS OF DEC. 21, 1971. *(Tokuteibi no SO2 koosen ni tsuite- Showa 46 nen 12gatsu 21 nichi no kaiseki). Text in Japanese. Kishocho Gijutsu Shiryo: Taiki Osen Kisho Yoho Shiryo (Air Pollut. Weather Forecasting Data, 15(2):66-68, Feb. 1974.*

On Dec. 21, 1971, an extraordinary high sulfur dioxide concentration covered greater Osaka. Locally high concentrations of 0.28-0.29 ppm appeared from Amagasaki to North Osaka, and the hourly average of 0.20 ppm continued for more than 2 hr. Some heat islands were noted in various parts of the city of Osaka. Generally the wind was weak (average 0.8 m/sec). A high pressure area extended from western Japan to the middle of Japan, and a low pressure area existed along the coast of Chiba Prefecture in the Atlantic ocean. The pressure gradient of the greater Kinki region centered upon Osaka for days of more than 0.20 ppm of SO2 (hourly average), for the winter of 1971 was 3.5 mb/280 km or less, 44 cases out of 49. On Dec. 21, the pressure gradient at 6 am was 2.1 mb/280 km, and the wind angle was 40 deg to the ground. There was a 200 m surface inversion in the Shinomisaki area, but there was no other inversion in other surrounding areas or in Osaka. The most immediate cause of the high pollution was the westerly wind which switched from east at about 9:20 am and continued until 10:30 am The velocity was 1 m/sec.

45927 **APTIC NO. 68994**

Koizumi, Kiyoaki

ACID RAIN AND ITS EFFECTS ON ENVIRONMENT. *(Sansei no ame to kankyo eno eikyo). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 10(6):1845-1850, June 1974. 17 refs.*

Measurement of pH value of rains which fell on Jan. 21, and Feb. 25, 1974 in places adjacent to the coast of Ise Bay and Mikawa Bay yielded values in the Ise Bay of 4.37 and 4.17 and in Mikawa Bay 4.4 and 4.18. Sulfur dioxide emitted from petroleum fuel is probably responsible for the acid rains and Nagoya City and Yokkaichi City in which steel manufacturing plants, thermal power stations, and chemical plants are concentrated are most severely polluted areas. The SO2, brought by north-west seasonal winds, is supposed to spread into the Ise Bay as well as in the direction of Atsumi Peninsula. Acidity of rains is confirmed by the fact that petals of morning flowers lose or change color. Acid rain has been falling since the beginning of 1960 in Sweden and Norway. The source of acid rain exists in highly industrialized nations. Acid rains in both countries are damaging soils, rivers, and marshes, fresh water fish, forests, steel products, and construction materials. For this reason the Organization for Economic Cooperation and Development launched a study on countermeasures against acid rains on an international level in 1972.

45928 **APTIC NO. 68672**

Kojima, Takayoshi

AIR POLLUTION IN THE KYUSHU REGION JUDGED BY THE INSOLATION INTENSITY. (Nissharyo kara mita Kyushu chiho no taiki osen ni tsuite). Text in Japanese. Fukuoka-kanku Kisho Kenkyukai-shi (Proc. Fukuoka Distrct Meet. Study Meteorol.), no. 35:19-21, Oct. 1974.

The distributions of direct solar radiation intensity, turbidity factor and secular variations in direct solar radiation intensity, and turbidity factor and horizontal insolation intensity were investigated by compiling available data dated back to 1934. The data, though incomplete, were compiled from the record at eight meteorological observatories in the Kyushu region. No definite correlation was found between monthly variation in direct solar radiation intensity and turbidity factor. The analogous curves of monthly variations in turbidity factor and relative humidity indicate the effect of humidity on turbidity factor. The secular variation in direct solar radiation intensity showed a decreasing tendency of 0.0057 cal/yr, while the turbidity factor showed an increasing tendency of 0.0419/yr, which was presumed to be attributable to air pollution. The secular variation in horizontal insolation intensity also showed a decreasing tendency.

45929 **APTIC NO. 68500**

Kubo, Tomohiro

THE USE OF THE UPPER AIR CURRENT OBSERVER (PIBAL) FOR PHOTOCHEMICAL SMOG FORECASTING. *(Joso kiryu kansoku (phibal) no kokagaku sumoggu yoho e no riyo). Text in Japanese. Kishocho Gijutsu Shiryo: Taiki Osen Kisho Yoho Shiryo (Air Pollut. Weather Forecasting Data), 15(2):64-65, 1974. 7 refs.*

The use of a pibal (pilot balloon) for meteorological observation in relation to air pollution monitoring was started for forecasting potentially high pollution by sulfur dioxide. The application of this instrument for measurement of oxidant has been in practice for some time now, and part of the available data are analyzed. The relationship between oxidant concentration and the use of pibal shows that the daily maximum oxidant concentration appears generally within the sea breeze zone. The movement of the sea breeze can be predicted by the upper altitude breeze in the morning, therefore the use of a pibal can be extremely useful. The Osaka, when the westerly wind is blowing strong covering a depth that reaches a high altitude, the sea breeze cannot encroach the inland. But when the westerly wind is blowing at a higher altitude, the sea breeze easily encroaches inland, and the time of entry is early and the speed of movement is fast. The Osaka pibal data of over 0.1 ppm oxidant days between June and October 1972 were classified into four types and the oxidant concentration distribution of each type in various parts of Osaka Prefecture were studied.

45930 **APTIC NO. 69035**

Kubo, Tomohiro

METEOROLOGICAL POTENTIALS FOR AIR POLLUTION (SOX) IN OSAKA. *(Osaka ni okeru taiki osen (SOx) kisho potensharu ni tsuite). Text in Japanese. Kishocho Gijutsu Shiryo: Taiki Osen Kisho Yoho Shiryo (Air Pollut. Weather Forecasting Data), 15(2):57, Feb. 1974.*

Osaka data for Nov. 1971 to Feb. 1972 was examined as basic data eventually leading to prediction for a greater area. The wind velocity, the wind direction, the ground inversion, the ground inversion index, the wind velocity at 9 am, the sea and land breezes, and inversions in the middle atmosphere were examined. When the wind was less than 3 m/sec for 2-3 hr in the morning, the tendency for pollutants was to increase for the day, but when a northeast wind persisted sometimes the concentration did not rise; when the wind changed to the southwest, the concentration tended to rise. When the ground inversion was heavy and the wind velocity was less than 3 m/sec at 9 am, a high concentration covering a large area resulted; when the inversion was weak and the wind velocity was more than 5 m/sec, the pollutant concentration was low. A condition between these two can cause localized high concentrations. When the ground inversion was heavy at night and the wind was low, if the northern current flowed in the upper layer up to 1000 m, a high concentration was prevented. The effects of sea breezes are complex, but generally air pollution is heavy when the sea breeze approaches Osaka from the northeast at 9 am and the wind changes to the southwest at noon.

45931 **APTIC NO. 68957**

Kunitomo, Takeshi

DUSTS IN THE ATMOSPHERE AND SUSHINE. *(Taiki no sozatsubutsu to nissha). Text in Japanese. Kisho Kenkyu Noto (Meteorol. Study Note), no. 119:374-381, 1974. 11 refs.*

The behavior of the optical constant of dusts at various wavelengths extending from ultraviolet to ultra-infrared must be observed to gain information about the optical properties of dusts. If only the total energy of sunshine is considered, the ultra-infrared region has little effect on the optical properties of dusts, but it becomes a significant factor when considering the problem of thermal equilibrium reached by means of radiation which occurs at night (reflection and absorption). The dusts in the atmosphere, in most cases, possess a high scattering coefficient. The optical constant and rate of complex refraction of soot in urban areas are presented as examples. The effects of radiation on minute particle layers inducing multiple scattering and multiple absorption were studied. The results obtained from measurement of light scattering at 5460 and 4360 A respectively by 0.530 micron polystyrene particles are also presented.

45932 **APTIC NO. 68488**

Lacaze, J.

NEW APPROACH TO AIR POLLUTANT DIFFUSION PROBLEMS - APPLICATION METHODS. *(Nouvelle approache des problemes de diffusion de la pollution atmospherique - Methodologie d application). Text in French. Meteorologie, vol. 29:1-8, Jan.-March 1974. 15 refs.*

A method is proposed for solving the diffusion equation for suspended pollutants. This method can be applied to a chain of telemetry stations. Velocities caused by turbulence are considered as perturbations in relation to general flow. This leads to equations which complement the diffusion equation and make it possible to calculate Kx and Ky, provided the distribution X of the concentrations at a given time is known. Considered by themselves, the equations of the perturbations supply the meteorologic parameters which enter into the diffusion equation. The latter can then be solved numercially with respect to X, i.e., the pollution at a given location becomes predictable. The method can be directly applied to cases of non-permanency.

45933 **APTIC NO. 68557**

Lipatov, V. B.

IDENTIFICATION AND EVOLUTION OF A DUST-SAND STORM ABOVE NORTH AFRICA FROM METEOROLOGICAL SATELLITE PICTURES. *(Obnaruzheniye i evolutsiya pyle-peschanoy buri nad severnom Afriki po snimkam s meteorologicheskikh sputnikov Zemli). Meteorol. i Gidrol., no. 4:78-80, April 1974. 5 refs. Translated from Russian. Leo Kanner Associates, Redwood City, Calif., 8p., June 1974. (National Aeronautics and Space Administration Contract NASW 2481, Rept. NASA TT F-15691.)*

NTIS: N74-25892

Television images obtained from Soviet and American meteorological satellites were used to study the formation and development of a dust-sand storm over North Africa. The dust cloud was seen in the form of band with diffuse boundaries, up to 80 km wide. The band was considerably less bright than the cloud cover, extending from Cyrenaica to Greece. The dust moved with the southerly flow at a speed of 36 km/hr, and the flow was maintained at an altitude of 5 km. The images indicated that dust storms and flows in the atmosphere undergo daily fluctuations, with maximum development occurring at 14-15 hr. The dust flows appeared to develop in conjunction with mesoscale meteorological structures and passed through a number of evolutionary stages, starting from the vortex at the surface to the formation of a dust flow at high altitudes.

45934 **APTIC NO. 68517**

Lopez, A., J. Servant, and J. Fontan

METHODS FOR MEASURING THE INTENSITY OF AITKEN NUCLEI SOURCES IN THE ATMOSPHERE. APPLICATION TO SOME OF THE PRINCIPAL SOURCES IN THE SOUTHWESTERN PART OF FRANCE. *(Methodes de mesure de l intensite des sources de noyaux d aitken dans l atmosphere. Application a quelques-unes des principales sources du sud-ouest de la France.) Text in French. Atmos. Environ., 8(7):733-754, July 1974. 5 refs.*

Different methods for measuring the intensities of Aitken nuclei sources in the atmosphere are presented based on data obtained from aircraft measurements. The intensity of a small source area, a few sq km, is obtained by the vertical repartition of the concentrations in the plume. For a larger source area, 10,000 sq km, this intensity is determined from the variation with time of day of the vertical profiles of the concentration. The accuracy of the different methods is discussed. Measurements were made in the Southwestern part of France: the urban district of Toulouse with 400,000 inhabitants (flux 5 times 10 to the 17th power nuclei/sec); the industrial site of Lacq (flux 1 times 10 to the 18th power nuclei/sec); the coniferous forest of Landes (intensity 100,000 nuclei/sq cm/sec); the rural area of the Midi-Pyrenees (intensity 30,000 nuclei/sq cm/sec). The natural sources of the region are stronger than the artificial sources, 75% compared with 25%.

45935 **APTIC NO. 68946**

Maejima, Takaaki

ANALYSIS OF SULFUR OXIDES HIGH CONCENTRATION POLLUTION IN THE FUJI AREA. *(Io sankabutsu konodo osen kaiseki (Fuji Chiku)). Text in Japanese. Shizuoka-ken Kogai Boshi Senta Nenpo (Bull. Environ. Pollut. Contr. Res. Center Shizuoka Prefect., no. 1: 118-121, March 1974.*

The pollution conditions of the Fuji area were analyzed in the light of the meteorological factors (mainly the wind directions) in the area. The detailed study showed that specific small localities were affected strongly by specific winds, and the time of high concentrations could be pinpointed in each area. The Fuji Health Center was affected largely by northwest winds, with typical patterns in January to March and April to June. The Yoshihawa No. 3 Junior High School with a hill on its north side was heavily polluted in southerly to southeasterly winds. In the Working Youth Hall, high pollution occurred when the air was very quiet, typically between October and Dec. At the Motoyoshihara Junior High School, the predominent wind is north in winter and south in summer, but regardless, high concentrations occurred only in the winds from the limited direction of north to northwest. Since its south side faces the sea, there is almost never a high concentration of above 0.1 ppm in southerly wind from the sea.

45936 **APTIC NO. 69126**

Marks, Jacky R.

ACOUSTIC RADAR INVESTIGATIONS OF BOUNDARY LAYER PHENOMENA. *Oklahoma Univ., Norman, National Aeronautics and Space Administration Contract NAS8-28659, Oklahoma Univ., Code M 128, NASA-CR-2432, 65p., May 1974. 20 refs.*

NTIS: N-74-23183

A comparison is made between acoustic radar echoes and conventional meteorological data obtained from a tower 6 mi north of Oklahoma City, Oklahoma, for the purpose of better understanding the relationships between acoustic radar echoes and boundary layer processes. Two thunderstorm outflow cases are presented and compared to acoustic radar data and Charba s gust front model. The acoustic radar echoes reveal the boundary between cold and warm air and other areas of mixing and strong thermal gradient quite well. The thunderstorm outflow of June 27, 1972 compares well in most respects to Charba s gust front model. The major difference is the complete separation of the head from the main body of cold air, probably caused by erosion of the area behind the head by mixing with the ambient air. The second case does not compare as well, probably due to the weakness of the storm. Two cases of nocturnal inversions caused by advection of warmer air aloft are presented. Areas of turbulent mixing or strong thermal gradient can be identified quite easily in the acoustic radar record. Possible mechanisms for the formation and dissolution of these inversions are discussed and related to the synoptic pattern. The qualitative data afforded by acoustic radar echo patterns can be quite valuable in the study of the boundary layer.

45937 **APTIC NO. 69837**

Matso, Kiyoko

AIR POLLUTION IN WAKAYAMA-REPORT NO. 8. *(Wakayama-shi no taiki osen ni tsuite). Kishocho Gijutsu Shiryo: Taiki Osen Kisho Yoho Shiryo (Air Pollut. Weather Forecasting Data). Text in Japanese. 15(2):70-72, Feb. 1974.*

The relationship between inversions and air pollution in the Wakayama area was investigated by examining the data of inversions from March-April and July-August 1972. All cases in which the temperature in the higher altitude was higher than that of the lower levels were considered inversions. At both locations, inversions occurred more frequently in the summer than in the spring, but differences of more than 5 C occurred in the spring on the mountain, and in the summer at Kainan in a very unstable fashion. At Mount Nagusa, high sulfur dioxide concentrations (0.1 ppm or more) appeared on days with intense inversions, but the concentration could be low or very high on days of the front type inversion. In Kainan, a close relationship was noted between inversions appearing at the altitude of 60 m between 2 and 4 pm with the morning inversion on the day after, and the degree of inversion was greater in the morning inversely with lesser inversions on the previous day. A case study of a strong inversion on April 17, 1972 showed that the peak of inversion in Kainan appeared 4-6 hours later than that of the mountain, and the peak of sulfur dioxide pollution came 6 more hours later.

45938 **APTIC NO. 68444**

Matsuo, Kiyoko

AIR POLLUTION IN WAKAYAMA (REPORT NO. 6). *(Wakayama-shi no taiki osen ni tsuite). Text in Japanese. Kishocho Gijutsu Shiryo: Taiki Osen Kisho Yoho Shiryo (Air Pollut. and Weather Forecasting Data), 15(2):56, Feb. 1974.*

The air pollution pattern in Wakayama was studied on highly polluted days. A high sulfur dioxide concentration of about 0.3 ppm occurred on April 19, 1971, and on this day, the peak appeared in the eastern area of the city, which gradually moved to west to the harbor when sea breeze started; at 3 pm, the wind changed completely to west and the peak appeared in northwest of the city. On days of high dust concentration, Aug. 26-27, 1971, land and sea breezes were weak and high pressure of the summer type dominated the city. The dust counts at three monitoring stations ranged from about 50 to over 400. The patterns at two stations, one in the northwest and one at the harbor were very similar, but the location between the two others remained quite different, maintaining the level of below 100 at all times. At the other stations, very high peaks of 300-400 appeared at 5 pm and 3 am.

45939 **APTIC NO. 68326**

Maybank, J., Y. Yoshida, and R. Grover

DROPLET SIZE SPECTRA, DRIFT POTENTIAL, AND GROUND DEPOSITION PATTERN OF HERBICIDE SPRAYS. *Can. J. Plant. Sci. (Ottawa), vol.. 54:541-546, July 1974. 10 refs.*

Droplet size spectra and quantity of spray drift were studied for two types of flat-fan nozzles. The large orifice flat-fan nozzles operated at reduced pressure produced less drift potential; however, the spectrum of droplets was coarse. The properties of the whirl jet cone nozzles suggested that these would also produce less drift-prone material. The spray friction likely to drift was calculated to be approximately 3-8% of the total volume of spray with the flat-fan nozzles. This was confirmed in field experiments using labelled herbicides and a liquid scintillation counting technique. A relastic pattern of the distribution of ground deposition density over a swatch (obtained by field experiments), and a factor of three in density fluctuation suggested that the generally accepted concept of uniformity of spray distribution in experimental plots should be modified. Recommendations of spray drift control technique were proposed regarding the hydraulic pressure, nozzle height and orientation, travelling speed/pressure, and the size of the orifice. (Author abstract)

45940 **APTIC NO. 69125**

McLellan, Alden, IV

CHANGES IN THE GLOBAL ENERGY BALANCE. A REPORT TO THE U. S. ENVIRONMENTAL PROTECTION AGENCY (FINAL REPORT). *Wisconsin Univ., Madison, Center for Climatic Research, Environmental Protection Agency Contract 68-02-1308, Task 29, ROAP 21ADE-010, Program Element 1AB012, Institute for Environmental Studies Rept. 31, Rept. EPA-650/2-74-116, 27p., Oct. 1974. 69 refs.*

NTIS: PB 238075/AS

The effect of aerosols on the Earth s climate and the global energy balance was studied. There is much evidence that the Earth s climate has undergone a wide variety of fluctuations. Over the past hundred millenia, as the Earth s surface temperature has decreased, volcanic dust in the atmosphere has increased (and vice versa). At least 40% of today s atmospheric particulate loading is due to man-made or man-accentuated sources. For the past 30 years, although the Earth s annual mean temperature has been decreasing, volcanic activity has not been increasing. Carbon dioxide and waste heat production have been increasing, but these processes tend to increase the global temperature rather than to reduce it. Man s production of particulates in the past 30 years has been increasing at a rapid rate. It is estimated that the loading rate of particulates from commercial jet aircraft into the stratosphere, where the residence time is much longer than in the troposphere, is almost half of that due to volcanic activity. Studies should be carried out to obtain better data for more meaningful estimates for the sources and sinks of atmospheric particulates. (Author abstract modified)

45941 **APTIC NO. 68628**

Miller, John M. (ed.)

GEOPHYSICAL MONITORING FOR CLIMATIC CHANGE. NO 1. SUMMARY REPORT - 1972. *National Oceanic and Atmospheric Administration, Boulder, Colo., Environmental Research Labs., 84p., Jan. 1974. 62 refs.*

GPO

Trends of trace constituents important to climate change and of elements which can assist in apportioning the source of changes to natural or anthropogenic sources were studied. Observations were taken to Mauna Loa Antarctica, Barrow (Alaska), and Samoa as representative polar, mid-latitude, and tropical sites. The measurement methods and results of measurements of carbon dioxide, total ozone, surface ozone, aerosols (MLO ruby laser radar system and Aitken nuclei measurements), wind, temperature and dew point, pressure, precipitation, solar radiation, strontium (90), total surface particulate matter, surface tritium concentrations, condensation nuclei, surface SO2 and nitrogen dioxide, precipitation collection for chemical analysis, fog, and atmospheric extinction, are described. The data acquistion system, instrumentation, regional stations, staff, and computer program for lidar computations are discussed.

45942 **APTIC NO. 68947**

Murata, Motohide

STUDIES ON THE FORECASTING OF OXIDANT CONCENTRATION (REPORT NO. 1). *(Okishidanto nodo no yosoku ni kansuru kenkyu). Text in Japanese. Mie-ken Kogai Senta Nenpo (Mie Prefect. Pub. Nuisance Center), no. 2:42-51, March 1974. 40 refs.*

As methods for forecasting of oxidant concentration, multiple regression analysis and discriminant analysis were attempted. The factors taken into the analyses were measurements of: oxidants, nitrogen oxides, sulfur oxides, hydrocarbons, suspended particulates, sunshine, temperature, humidity, wind direction, wind velocity, clouds, weather, maximum temperature, temperature difference, minimum humidity, and visibility. When using 17 factors in the multiple regression analysis, the multiple correlation coefficient was 0.951, but there were too many factors. The factors that contributed less were discarded to obtain a maximum F index, and only NOx, solar radiation, temperature, maximum temperature, minimum humidity, weather, and visibility remained for the best result. The value of F was less than 0.1% critical rate and the determination index was 0.875. The prediction equation was the multiple correlation index plus 0.935. However, factors such as maximum temperature and minimum humidity are unobtainable for prediction purposes; therefore the equation remains as an explanatory formula rather than an oxidant concentration forecasting formula. Discriminant analysis was tried with four combination groupings of pollutant and weather factors, and factors were gradually reduced. But with the reduction of number of factors, accurate discrimination became difficult.

45943 **APTIC NO. 68698**

Naito, Masaaki and Suehiro Otoma

AIR POLLUTION DIFFUSION MATRIX AND ITS APPLICATION. *(Taiki osen denpa matorikusu no teian to sono riyo). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 3(8): 545-549, Aug. 1974. 10 refs.*

Pollution concentration is determined by emission concentration and a specific coefficient. The latter is dependent on locations of stack and monitoring station, stack effective height, wind direction, wind velocity, atmospheric stability, and topography. For long-term average concentration from more than one source, average wind velocity and wind direction are used. A source- receptor matrix is derived as follows: selections of model and equation for the calculation of effective stack height; collection and treatment of required data on sources, meteorology, and concentration; estimation of parameters of the model from observed data; and determination of sensitivity coefficient for each source and relative monitoring station. The source-receptor matrix method was applied to the establishment of pollution countermeasure standards in Okayama by using the Sutton equation as the model and Holland s equation for effective stack height. The best locations for monitoring stations and the optimum decrease of emission concentration were obtained from calculations.

45944 APTIC NO. 68625

Nordo, J.

PRELIMINARY NOTES ON LARGE SCALE MASS TRANSPORT. *In: Technical Evaluation Report on Round Table Discussion of Fluid Dynamics Panel on the Fluid Dynamics Aspects of Air Pollution Related to Aircrafe Operations. North Atlantic Treaty Organization, Neuilly-sur-Seine (France), Advisory Group for Aerospace Research and Development, AGARD-AR-55, p. 33-39, Feb. 1974.*

Mesoscale flow includes all circulation patterns with wavelengths between 20 and 500 km such as land-sea breezes and urban heating. To study the scales of mean circulation over Europe, a space correlation analysis was made of monthly averages of station pressure and precipitation for the years 1881-1930. Acid precipitation in southern Norway due to the long range transport of sulfur from the industrial centers of western Europe was also studied. A network is proposed for providing information about the transport and transformation of emitted sulfur components. An emission survey and meteorological data will also be required for the project. A statistical view of the relationship of weather to pollution concentrations will be used in other investigations.

45945 APTIC NO. 69062

O Brien, Robert J., John R. Holmes, and A. H. Bockian

PHOTOCHEMICAL AEROSOL FORMATION IN THE ATMOSPHERE AND IN AN ENVIRONMENTAL CHAMBER. *Am. Chem. Soc., Div. Environ. Chem., Prepr., 14(1):33-38, 1974. (Presented at the American Chemical Society, Division of Environmental Chemistry, National Meeting, 167th, Los Angeles, Calif., April 1-5, 1974, Paper 8.)*

Photochemical aerosol formations were measured in the atmosphere and in an environmental chamber. Chromatograms of measurements made in the Los Angeles air in 1969 and chamber generated aerosols were similar and showed monocarboxylic acids, dicarboxylic acids, and acid nitrates. Infrared spectra of the two types of aerosol were similar, but different from those of directly emitted auto exhaust and of a typical aromatic. Laboratory analyses of consecutive 2-hour particulate samples obtained at several sites in the South Coast Basin in 1973 showed lead, nitrate, ammonium sulfate, bromine, and various organic compounds. The diurnal variations in total particulate concentration were similar and agreed with the reaction profiles for particulate and oxidant build-up found in chamber runs.

45946 APTIC NO. 68987

Ojima, Toshio, Tatsuo Oka, Masato Kamase, and Kunihiko Hirasawa

STUDIES OF HEAT DIFFUSION AT CITY SCALE. (1) INVESTIGATION OF THERMAL ENVIRONMENT IN TOKYO. *(Toshi kibo netsu kakusan ni kansuru kenkyu. (Sono 1) Tokyo ni okeru netsuteki kankyo chosa). Text in Japanese. Preprint, Japan Society of Architecture, Tokyo, p. 305-306, 1974. 2 refs. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4153.)*

The phenomenon of heat islands in urban space was investigated in Tokyo, and histograms were made of temperature and absolute humidity. Fourteen measuring stations were utilized, and measurements were made of temperature, humidity, wind direction, and amounts of cloudiness and sunshine from April 1972 to March 1973. The histograms of temperature and absolute humidity varied with the location of the measuring station, time of day, and time of year. Thermal equilibrium conditions on the ground also had an important effect on the temperature and humidity distributions.

45947 APTIC NO. 68988

Ojima, Toshio, Tatsuo Oka, Kunihiko Hirasawa, and Masato Kamase

STUDIES OF HEAT DIFFUSION AT CITY SCALE. (2) INVESTIGATION OF THERMAL ENVIRONMENT IN TOKYO. *(Toshi kibo netsu kakusan ni kansuru kenkyu. (Sono 2) Tokyo ni okeru netsuteki kankyo chosa). Text in Japanese. Preprint, Japan Society of Architecture, Tokyo, p. 307-308, 1974. 2 refs. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4154.)*

Statistical treatment is presented for temperature and absolute humidity measurements taken at 14 stations in Tokyo from April 1972 through March 1973. The heat and humidity distributions were plotted on regional maps. The heat island phenomenon was pronounced during winter, but diffuse in the summer.

45948 APTIC NO. 68989

Ojima, Toshio and Tatsuo Oka

STUDIES OF HEAT DIFFUSION AT CITY SCALE. (3) BASIC THEORETICAL ANALYSIS OF HEAT DIFFUSION. *(Toshi kibo netsu kakusan ni kansuru kenkyu. (Sone 3) Netsu kankusan ni kansuru kiso riron kaiseki). Text in Japanese. Preprint, Japan Society of Architecture, Tokyo, p. 309-310, 1974. 4 refs. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4155.)*

Heat diffusion equations are presented, based on considerations of macroscopic convection phenomena in the atmosphere. A three-dimensional model was constructed for evaluation, where the heat source (150 kcal/sq m) was at the center of a square whose sides were 7500 m long. The measured height above the heat source was 400 m. Diffusion constants and wind velocity were postulated. Non-stationary state calculations were made over a one-hour time period, at the end of which a stationary state was assumed to have been attained. The proper choice of boundary conditions for the atmospheric layers is necessary to minimize errors involving wind velocity.

45949 APTIC NO. 69017

Okabayashi, Masahiro

VISIBILITIES IN 1958 AND RECENT YEARS. *(1958 nendai to saikin no shitei ni tsuite). Text in Japanese. Kishocho Gijutsu Shiryo: Taiki Osen Kisho Yoho Shiryo (Air Pollut. Weather Forecasting Data), 15(2):53, 1974.*

Investigations of visibility were conducted first between 1957 and 1959, and for the second time, between 1968 and 1971 in Yatsuo, the results were compared. The measurements were taken between 9 am and 5 pm every hour. If the meteorological changes between these two periods can be ignored, the changes in visibility can be regarded in a broad sense as the change in the air pollution scene. The difference in pollutants was partly the change from coal to fuel oil, and the difference in the quantities of pollutant could be accounted for by the increase in the fuel consumption. Some new emission sources were added between the two periods in the western limit of Yatsuo. The frequency distribution changed, and for the second period, good and bad visibilities increased and the medium visibility of between 10 and 24 km decreased. Seasonally, the trend reversed completely, and for the second period, the average visibility was bad between April and Sept. and was good between Jan. and March. for the first period, the worst month was Nov. and for the second it was June. Throughout the year, the number of less than 2.3 km visibility increased, and in warmer seasons, the frequency of 0.5-10 km vibility also increased. These were mostly on days of south-southwest to west- northwest winds. The pollutant was smoke 52% of the time. The frequency of less than 4.9 km visibility for the entire day increased four times, and 44% of these occurred on days of no precipitation.

45950 **APTIC NO. 68939**

Parry, H. Dean

THE ACOUSTIC SOUNDER: POLLUTION FIGHTER S TOOL. *National Oceanic and Atmospheric Administration, Silver Spring, Md., Systems Development Office, NOAA-TM-NWS-EDL-12, 15p., March 1974.*

A measurement of the depth of the mixing layer is an important parameter in understanding and dealing with the air pollution problem. A model is proposed which uses this measurement and surface wind measurements to provide a good approximation to the ventilation rate. The pure acoustic sounder is capable of measuring the depth of the mixing layer by measuring the height and thickness of inversions and the height to which convections extend. The acoustic sounder continuously monitors this depth, even through smog, fog, or low clouds, and thereby provides constantly updated information as well as information on the time rate of change of this depth. (Author abstract)

45951 **APTIC NO. 68304**

Payrissat, Maurice

THE CYCLE OF SULPHUR DIOXIDE IN THE ATMOSPHERE. *Eurospectra, 13(1):16-22, March 1974. 7 refs.*

The sulfur dioxide cycle in the atmosphere is reviewed. Natural sources of SO2 are volcanoes, forest fires, and oxidation of hydrogen sulfide produced by the breakdown of living matter. The remaining 95% of the SO2 in the atmosphere is anthropogenic, most of it caused by coal burnin, the burning and refining of heavy petroleum products, and the treatment of pyrites in foundries. As SO2 diffuses throughout the atmosphere it becomes a global pollutant. Since SO2 is a reducing agent, it tends to oxidize in the atmosphere to sulfate and sulfite. The transformation is promoted by a number of factors such as photochemical interactions with ozone and sunlight. Rain can be contaminated with the sulfur compounds and become acidic. As a result of man-made pollution, the amount of sulfur processed by nature has increased by half. The sulfur compounds are absorbed in soil and vegetation and enter the oceans through the rain. Plants and soil bacteria metabolize the SO2 and sulfates they absorb, converting them to H2S which is emitted into the atmosphere to be reoxidized photochemically into SO2 in the presence of ozone. Part of the soil enters the oceans. The lifespan of SO2 depends on meteorological factors involved in the chemical conversion of SO2 into sulfates and by absorption in the surface of the soil. Laboratory methods to measure absorption of SO2 by soil include the aerodynamic, West and Gaeke, hydrogen peroxide, and electroconductivity methods. Mathematical formulas are given to determine the SO2 deposition on standard European soils.

45952 **APTIC NO. 68686**

Pueschel, Rudolf F., Charles C. Van Valin, and Farn P. Parungo

EFFECTS OF AIR POLLUTANTS ON CLOUD NUCLEATION. *Geophys. Res. Lett., 1(1):51-54, May 1974. 11 refs.*

The nucleation efficiency of an urban aerosol is closely related to its chemical composition, which is strongly affected by human activities. This effect was studied using data from the South Platte River valley on the northeast edge of Denver, Colo. Results of typical Denver pollution episodes and the variation of the chemical composition of the Denver aerosol with time are shown. The high proportion of particles containing the elements aluminum, silicon, and calcium does not vary significantly with time -- proof of the strong clay mineral character of the background aerosol formed in and around Denver. The fraction of particles containing lead, sulfur, and chlorine are subject to strong variations with time and have apparent peaks during the rush hour. The primary source of these elements is human activities. The cloud and ice nucleating properties that are associated with chemical change were studied. Sulfates and lead bromochloride temporarily increase the surface solubility and capillarity of naturally produced insoluble clay particles. This phenomenon alters the atmospheric nuclei budget and affects the natural mechanisms that remove pollutants from the atmosphere. Particulate matter of 5-10 micron is generally removed by inertial impaction with raindrops, while smaller particles are removed by Brownian diffusion of aerosols of less than 0.01 micron radius into cloud droplets. Therefore a gap occurs in the particle size distribution from 0.05 to 5 micron, where neither aerodynamic impaction by raindrops or Brownian capture by cloud droplets can remove aerosols with appreciable efficiency. The width of the scavenging gap of the optically most active aerosol sizes should be significantly reduced during air pollution eposides, when increased solubility and capillarity enhance the rainout mechanism. (Author abstract modified)

45953 **APTIC NO. 68848**

Reck, Ruth A.

INFLUENCE OF AEROSOL CLOUD HEIGHT ON THE CHANGE IN THE ATMOSPHERIC RADIATION BALANCE DUE TO AEROSOLS. *General Motors Corp., Warren, Mich., Physics Dept., Res. Pub. GMR-1560, 24p., April 4, 1974. 14 refs.*

A radiative-convective atmospheric model for 35 deg N latitude in April is used to demonstrate the influence of aerosol cloud height on the change in the atmospheric radiation balance and temperature profile due to aerosols. Three different aerosol optical densities (0.065, 0.325, and 0.650) are considered as well as three mean aerosol cloud heights, corresponding to pressures of 958 mb, 418 mb, and 41.5 mb. In all cases considered, the surface temperature difference due to aerosols ranges between -3 K and + 0.4 K, with small magnitudes corresponding either to high aerosol clouds or to high surface albedo. The effect of surface albedo is included by considering surface albedo values of 0.07, 0.3, and 0.6. Aerosols reduce the magnitude of total radiative cooling of the atmosphere, resulting in an effective heating of the Earth s surface and an increase in the atmosphere s reflectivity, and thus reduce the amount of solar energy absorbed, resulting in an effective cooling at the Earth s surface. The first effect results from a trapping of the radiation by the aerosol and the absorption of this radiation by ozone, water, and carbon dioxide. A low-lying aerosol with an optical density 10 times the present background value, when situated over a reflecting surface such as water causes a 1.5% decrease in the radiative cooling of the atmosphere and a 3.8% decrease in solar flux absorbed in the earth-atmosphere system. The combined heating and cooling produces a surface temperature difference of -3 K. For aerosols near the surface and over a reflecting surface such as snow, an aerosol optical density 10 times the present background values produces a 0.7% decrease in the present value of the radiative cooling of the atmosphere and a negligible decrease in the solar radiation flux absorbed in the earth-atmosphere system. The combined effect results in a surface increase of 0.4 K. (Author abstract modified)

45954 **APTIC NO. 68430**

Reiter, Reinhold

BOUNDARY LAYER AEROSOL TRANSPORT MEASUREMENTS IN A VALLEY SYSTEM (FINAL TECHNICAL REPORT). *Inst. fuer Atmosphaerische Umweltforschung, Garnisch-Partenkirchen (Germany), Army Contract DAJA 37-73-C-1806, Proj. 2MO61102B53B, 34p., Jan. 1974. 20 refs.*

NTIS, DDC: AD 781 010

Preliminary arrangements for a field experiment on the dispersion of fluorescent test aerosol particles within a mountain valley are described. Twenty rotorod samplers and 100 H-shaped vanes were constructed. The samplers were improved by a new electronic circuit to ensure constant speed of the vanes even if battery voltage drops. A microscopical bench was installed for the counting of fluoroscent particles in ultraviolet light. The aerosol generator was checked and test run. The procedure which used pilot balloons for exact determination of air currents in the valley was further developed and respective computer programs set up. Preparatory work was done for installation of the aerosol generator on top of an isolated hill within the valley. (Author abstract modified)

45955 **APTIC NO. 64893**

Reynolds, Steven D., Mei-Kao Liu, Thomas A. Hecht, Philip M. Roth, and John H. Seinfeld

MATHEMATICAL MODELING OF PHOTOCHEMICAL AIR POLLUTION-III EVALUATION OF THE MODEL. *Atmos. Environ., 8(6):563-596, June 1974. 26 refs.*

The results of model evaluation exercises carried out for the urban airshed model developed in Parts I and II are presented. Concentrations of hydrocarbons. Carbon monoxide, nitric oxide, nitrogen dioxide, and ozone in the Los Angeles airshed were simulated for 6 days in the fall of 1969. Prior to carrying out these simulations, rate constants and stoichiometric coefficients used in the kinetic mechanism that was incorporated in the airshed model were determined by separately validating the kinetic mechanism with laboratory smog chamber data for several hydrocarbon nitrogen oxide systems, including auto exhaust. In addition, to take into the effect of local sources on concentrations measured at certain Los Angeles County Air Pollution Control District monitoring stations, a simple microscale model was developed. This model was used to predict the local effect of a heavily-travelled roadway on concentrations measured at a near-by monitoring station. The overall results exhibited good enough agreement with the monitoring data to suggest that in the future air pollution models based on representation of actual physical and chemical processes can be important components of abatement strategy planning. (Author abstract)

45956 **APTIC NO. 69084**

Roberts, Paul T. and Sheldon K. Friedlander

CONVERSION OF SO2 TO AMBIENT PARTICULATE SULFATES IN THE LOS ANGELES ATMOSPHERE. *Preprint, National Inst. of Health, Research Triangle Park, N. C., National Inst. of Environmental Health Sciences and Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Development, 16p., 1974. [illegible] refs. (Presented at the Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Durham, N. C., April 16-19, 1974.)*

Gas phase and particulate phase sulfur were determined at various locations in the Los Angeles basin to determine atmospheric conversion rates and mechanisms. A new technique was developed for the measurement of particulate sulfur. From measurements of the particulate to gas phase sulfur ratio near the major stationary sources and far downstream and from estimates of travel times determined by air trajectory analysis, it is possible to estimate gas-to-particle conversion rates for sulfur. Such calculations show that automobiles presently contribute a major part of the total sulfur as measured at a receptor site such as Pasadena, while contributing only a small amount to the particulate sulfur loading. The introduction of oxidation catalyst-equipped vehicles may add significantly to the particulate sulfur at downwind receptor sites; predictions of particulate sulfur concentrations near freeways show substantial increases due to such vehicles. (Author abstract)

45957 **APTIC NO. 68348**

Sagendorf, Jerrold F.

A PROGRAM FOR EVALUATING ATMOSPHERIC DISPERSION FROM A NUCLEAR POWER STATION. *National Oceanic and Atmospheric Administration, Idaho Falls, Idaho, Air Resources Lab., Rept. NOAA TM ERL ARL-42, NOAA-74062710, 15p., May 1974. 1 ref.*

NTIS: COM-74-11336

A Site Evaluation Program computer code for estimating the atmospheric dispersion characteristics of potential sites for nuclear power stations is described. Concentrations of effluents normalized by the source strength of the power plant are calculated, and atmospheric dilution factors are computed for hourly and annual periods using data describing the power plant site and meteorology of the area. The program can be used for both ground level and stack releases, with plume rise taken into consideration if desired. The output includes a printout of the maximum wind speed in each class and the frequency of occurrence of the wind speed class. Also printed out are the values of wind speed occurring at any desired increment of frequency, as determined by fitting a curve to the wind speed and cumulative frequency data point. A plot of the data points and the curve is also optionally available. Similar tables and plots are included for the accident calculations. Tables of average annual effluent release versus distance and average values of effluent release for each segment are also printed out.

45958 **APTIC NO. 69981**

Saito, Heizo, Yo Matsuo, Osamu Nakano, Motoyasu Kamada, and Yuzo Sakamoto

FUNDAMENTAL STUDIES ON POLLUTANT DIFFUSION NEAR BUILDINGS (7). THE CASE OF DEPTH VARIATION IN THREE-DIMENSIONAL MODELS. *(Tatemono kinbo ni okeru osenbutsu kakusan ni kansuru kiso kenkyu (sono 7). Sanjigen mokei ni okeru okuyuki o henka shita baai ni tsuite). Preprint, Japan Society of Architecture, Tokyo, p. 185-186, 1974. 1 ref. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4093.)*

Wind tunnel studies of diffusion near buildings wherein the depth of the box-type square plates placed perpendicular to wind direction is varied are presented. The frontal surface dimensions of the plates were 18 cm by 18 cm. The depths of the box-type plates were 9 cm, 18 cm, and 36 cm. Blowholes (inside diameter, 4 mm phi; outside diameter, 6 mm phi) were constructed on plate and box-type models. Concentration distributions were measured. On all surfaces, concentration decreased as the blowhole height and the velocity of the expelled air increased. In the box-type model, the concentration decreased as the depth increased on the top and side surfaces. On the rear surface, both the maximum concentration and the average concentration showed highest values for the plate-type model.

45959 **APTIC NO. 68345**

Salzman, Jack A. and Thom A. Coney

ATMOSPHERIC TEMPERATURE MEASUREMENTS USING RAMAN LIDAR. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, Work Unit 501-04, Rept. NASA TN D-7679, E-7874, 25p., June 1974. 21 refs.*

Experiments were conducted to demonstrate that the Raman-shifted return of a lidar system can be used to remotely measure atmospheric temperature. The measurement technique involved simultaneously monitoring the intensities of two portions of the Raman signal sampled from a preset range and examining the ratio of their intensities. A theoretical analysis relating the ratio of the Raman spectral intensities transmitted by a variety of interference filter pairs was performed to establish a predicted temperature measurement sensitivity. Experimental data were obtained at a horizontal range of about 100 m for ambient air temperatures ranging from minus 10 to 22 C during both daylight and night time hours. Data were also obtained using a 12-meter long volume of temperature-controlled air. The temperature within the zone was varied from 25 C below to 15 C above the ambient air temperature. One minute of data acquisition, or 10 shots, can provide absolute temperature measurements with an accuracy of plus or minus 4 C at a distance of 100 m. (Author summary modified)

45960 **APTIC NO. 68681**

Sano, Isamu, Akie Tsuruizumi, Hiroshi Ohta, and Kimihiko Ohya

STUDIES ON THE MECHANISM OF FORMATION OF PHOTOCHEMICAL SMOG — MEASUREMENT OF AIR POLLUTION OVER ISE BAY. *(Kokagaku sumoggu no hassei genin kaimei ni kansuru kenkyu — Isewan kaimen oyobi joku taiki osen chosa). Text in Japanese. Aichi Kogyo Daigaku Kenkyu Hokoku (Bull. Aichi Inst. Technol.), no. 9:211-218, March 1974.*

As a part of investigations on photochemical smog in the Nagoya area and its formation mechanism, the air pollution over Ise Bay was measured. The air samples collected at 10 locations and at altitude 300 and 1000 m at one location on July 28 and Aug. 23 1973 were analyzed for oxidant, nitrogen dioxide, nitric oxide, and hydrocarbons. The meteorological factors (wind direction, wind velocity, temperature) and solar radiation were also measured. The pollutant concentrations measured were analyzed in relation to the meteorological factors to find the meteorological conditions associated with higher pollutant concentrations, and compared with data obtained in Nagoya. The nitrogen oxide and oxidant concentrations in Nagoya were generally higher than those over Ise Bay, which was presumed to be attributable to automotive exhaust gas in the city, however, the data were insufficient to draw any definite conclusion. The vertical distribution of pollutants was fairly uniform even at low wind velocities of 2-3 m/s.

45961 **APTIC NO. 68655**

Shinya, Kozo

THE LOCAL VENTILATION QUANTITY OF THE AIR AND METHODS FOR ITS CALCULATION. *(Taiki no chiiki kankiryo to keisen shuho). Text in Japanese. PPM (Japan), 5(11):61-72, Nov. 1974. 6 refs.*

The average atmospheric pollution concentration for a given region depends on the rate of ventilation of that area. The ventilation depends on the sources of pollution, as well as topographical considerations, including such factors as the presence of high- rise structures in cities. Models for calculating the ventilation values are helpful, but calculations can become too unwieldy and inaccurate. Nonetheless, there are useful equations for calculating average pollution concentrations. The urban diffusion models by Miller and Holzworth are used as bases for forecasting atmospheric pollution in the United States. In the Tokyo Bay region, a Box Model has been proposed as the basis for pollution calculations. In the differential equations for diffusion it is assumed that the horizontal diffusion term is smaller than the horizontal advection term, whereas the vertical diffusion term is larger than the vertical advection term. Ventilation values for the Tokyo area during July-August 1973 were calculated and related to various factors such as the altitudes of the inversion layer, mixing layer, and stable layer, average wind velocities at various altitudes, and the actual air pollution conditions.

45962 **APTIC NO. 68978**

Shoda, Takashi, Shuzo Murakami, and Keichi Ikeda

STUDIES OF THE LAW OF SIMILARITY ON DIFFUSION NEAR BUILDINGS: COMPARISON OF OUTDOOR MODEL AND WIND TUNNEL MODEL EXPERIMENTS. *(Tatemono kinbo no kakusan ni kansuru sojisoku no kento: okugai mokei jikken to fudo modei jikken no hikaku). Text in Japanese. Preprint, Japan Society of Architecture, Tokyo, p. 179-180, 1974. 2 refs. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4090.)*

Comparative experiments were performed with a wind tunnel and outdoor models to study similarities in diffusion behavior near buildings. The tracer gas used was ethylene, and concentration analysis was effected with gas chromatography. Gas expulsion positions were located in the interior wall, exterior wall, and ceiling. Equations were derived. Errors in the concentrations obtained from both models were great, though there was some correlation between the concentrations.

45963 **APTIC NO. 68686**

Slinn, W. G. N.

A BUOYANT PLUME MODEL FOR PEDESTRIANS. *Preprint, Atomic Energy Commission, Washington, D. C., 32p., Jan. 1974. 13 refs. (Presented at the Atomic Energy Commission Symposium on Cooling Tower Environment, College Park, Md., March 4-6, 1974.)*

NTIS: BNWL-SA-4481, CONF-740302-2

Equations for the steady-state rise of a buoyant plume are derived directly from the conservation laws for mass, momentum, and energy. Top-hat profiles are used, and it is assumed that there is no horizontal pressure gradient across the plume boundary. In the resulting equations there are four unspecified quantities: the drag and heat transfer coefficients, the entrainment velocity, and heat production. Results are shown for the isentropic case when all these quantities are zero, as well as for cases with various combinations of these quantities different from zero and using simple relaxation models. In this way some insight is gained into their separate effects on the plume's properties. Results of a simple model to account for a mean wind are also demonstrated. The need for more field data is obvious. (Author abstract)

45964 **APTIC NO. 68493**

Tanabe, Hisao and Einoshin Ashiba

PHOTOCHEMICAL SMOGS AND LOWER ALTITUDE INVERSIONS. *(Kokagaku sumoggu to teiso gyakuten). Text in Japanese. Kishocho Gijutsu Shiryo: Taiki Osen Kisho Yoho Shiryo (Air Pollut. Weather Forecasting Data), 15(2):80-81, Feb. 1974.*

On July 17, 1972, the day of the first photochemical oxidant incident of the Tokyo type in Hiroshima Prefecture, an unusual ground inversion phenomenon was noted in Kure. The weather factors were studied in Kure in July and Aug. 1973, on days of photochemical smog warnings. On July 7, when a warning was issued in nearby Otake, a lower layer inversion was noted in Kure. Western Japan on that day was covered by high pressure and there was a low pressure area in the Sea of Japan. In this type of weather, a ground inversion appears in Western Japan in the cold season, but not in the summer. However, on this day, the temperature in Kure was 22.8 C in early morning, and 24 C at the altitude of 150 m. The oxidant concentration was also high. On July 8th, there was no warning, but the oxidant concentration was even higher in Kure, though it never reached 0.15 ppm (warning level); there was an inversion at 150 m. for lack of data, no clear conclusion was reached; but a further study will be made on low layer inversions and photochemical smogs.

45965 **APTIC NO. 68670**

Tanabe, Takeshi

THE METEOROLOGICAL CHARACTERISTIC OF THE YAMAGUCHI BASIN (PART 2) -- LOCAL WEATHER AND AIR POLLUTION. *(Yamaguchi bonchi no kisho tokusei (Dai-2-ho) — kyokuchi kisho to taiki osen ni tsuite)). Text in Japanese. Fukuoka-Kanku Kisho Kenkyukai-shi (Proc. Fukuoka District Meet. Study Meteorol.), no. 35:190-193, Oct. 1974.*

In the eastern area of Yamaguchi Prefecture, the residents were afflicted with irritant gas on April 23 and 30, 1973. The meteorological conditions of these two days were analyzed to investigate the relationship with air pollution. The vector analysis of wind direction and velocity indicated that the malodor was carried into the basin with the south-western wind (sea breeze). The infiltration mechanism of the sea breeze front into the basin is discussed. The relationships between vertical distribution of temperature and oxidant and sulfur dioxide concentrations were analyzed. Higher oxidant and sulfur dioxide concentrations were associated with a high temperature gradient. The vertical distributions of average temperature, humidity, and wind velocity were analyzed and the patterns associated with higher pollutant concentration were described.

45966 **APTIC NO. 68047**

Tempelmeyer, Kenneth E.

SNOW, A WINTERTIME SINK FOR SULFUR DIOXIDE. *Louisville, Univ., Speed Scientific School, Ky.; International Assoc. for Pollution Control; American Chemical Society, Washington, D. C.; American Inst. of Chemical Engineers, New York; American Inst. of Industrial Engineers, New York; American Society of Civil Engineers, New York; American Society of Mechanical Engineers, New York; American Water Works Assoc., New York; Inst. of Electrical and Electronic Engineers, New York; and Water Pollution Control Assoc., Proc. Environ. Eng. Sci. Conf., Annu. Meet., Louisville, Ky., 1974, p. 737-754. 17 refs. (March 4-5.)*

Preliminary tests demonstrated that large quantities of sulfur dioxide may be sorbed by snow. The laboratory studies and analysis of air quality measurements in snow-covered areas indicated that snow cover may act as a sink for SO2, and presumably for other pollutants. Falling snow will not effectively capture SO2 in the atmosphere, but the fallen snow cover may provide an important SO2 sink which has not yet been considered. The absorbed SO2 can diffuse large distances through the snow and subsequently result in adverse water quality in areas remote from major emission sources. As the snow melts, a portion of the sorbed SO2 may re-evolve as a gas, and a portion may be carried off in the melt as dilute acid. This latter effect might be useful in explaining the increasing acidity in certain streams and lakes. Because SO2 emissions may increase during the fuel shortage as higher sulfur fuels are increasingly used, it is even more important that the fate of this air pollutant be understood as fully as possible. Based on the results of this study, an area of 1 sq mi covered by a 6-inch snow layer has the potential to capture and hold about 30 times 10 to the 6th power lbs of SO2. The entire process should be studied more completely. (Author abstract modified)

45967 **APTIC NO. 68512**

Tsunakawa, Masao

POLLUTION DAMAGE EPISODES BY ACIDIC RAIN AND COUNTERMEASURES. *(Sansei kou ni yoru higai no hassei to taisaku). Text in Japanese. Taiki Osen Nyusu (Air Pollution News), no. 83:2-6, July 1974.*

In the afternoon of July 3, 1974, numerous cases of eye irritation and pain were reported to the Tochigi Prefectural Government, Department of Health, Environmental Division. Many complained of acidic fog-like precipitations. The air pollution monitoring data for the day showed 0.03-0.04 ppm oxidant level, and the levels of nitrogen oxides, sulfur oxides, and carbon monoxide were all well within the legal standards. The temperature was 21-23 C, humidity 91-99%, the wind direction mostly NE, and the wind velocity 0.8-2 m/sec. There was an inversion layer at 500 m, and the visibility was poor (about 1 km with gaseous fog). On that day 5549 people (5145 children) reported the health effects, but the subsequent reports increased to a final number of 28,762 and 28,285 children). Similar damages occurred on this date in Saitama Prefecture and the northern Kanto region, but the number involved was greatest in Tochigi, and similar damages due to acidic rain-fog were noted on July 17 (71 persons and July 18 (225 persons). The pH levels on July 17 and 18 were about 3 and 4. The cause and the reaction mechanism were totally unknown, but industries using petroleum fuels and automobiles are definitely suspected as the primary source of the pollutants. Based on these incidents, a provisional prefectural ordinance was issued covering monitoring methods and warning systems and was enforced as of August 1. In addition to the pollutants regularly monitored, acidic precipitations are to be monitored by hydrogen ion, sulfuric acid ion, nitric acid ion, chlorine ion, and visibility.

45968 **APTIC NO. 68671**

Yamagata, Hideo and Shohei Shimagawa

AIR POLLUTION IN OHITA CITY. (PART 2). *(Ohita-shi no taiki osen ni tsuite (Dai-2-ho)). Text in Japanese. Fukuoka-kanku Kisho Kenkyukai-shi (Proc. Fukuoka District Meet. Study Meteorol.), no. 35:187-189, Oct. 1974.*

The oxidant concentration has been measured at eight locations in Ohita city and Saganoseki since Nov. 1973. The data compiled from from Nov. 1973 to June 1974 were analyzed in relation to meteorological factors, and a check sheet for forecasting high oxidant concentration was prepared. The check items are as follows: pressure pattern -- center or behind migratory high pressure with small pressure gradient; weather -- sunny or partly cloudy; wind direction -- north or east; wind velocity -- maximum velocity less than 5.0 m/sec; temperature -- maximum temperature above 25 C; visibility -- less than 10 km; insolation -- cumulative insolation before noon higher than 250 cal/sq cm; inversion layer, MMD -- less than 1200 m; land and sea breeze, wind velocity at upper atmosphere -- less than 10 knots up to 600 mb an/ less than 5 knots up to 900 mb; and ventilation capacity -- 3900-4000 cu m/sec. The items checked with conditions at the time of oxidant concentration higher than 0.1 ppm indicated 5-9 positives.

45969 **APTIC NO. 68660**

Yamaguchi, Toru

AIR POLLUTION IN HYOGO PREFECTURE (S47). *(Hyogo-ken ni okeru taiki osen ni tsuite). Text in Japanese. Kishocho Gijutsu Shiryo: Taiki Osen Kisho Yoho Shiryo (Air Pollut. Weather Forecasting Data), 15(2):68-69, Feb. 1974.*

The air pollution monitoring system of Hyogo prefecture was greatly enforced in 1972. Between May and Oct. 1972, photochemical smog forecastings were issued 44 times in 209 total localities (cumulative), warnings, 19 times in 36 localities, and health damages occurred 20 times involving 430 persons. Heavy pollution cases were concentrated between July and Sept., especially on Sundays and holidays. The pattern was very complex and unpredictable, appearing in areas other than places with warnings and in green areas in city suburbs. The area covered by the monitoring system includes the southern coastal cities of the Prefecture covering 100 km, 11 cities, 1 township, and 14 districts. Generally, the days were sunny with weak winds, poor visibility, high temperatures, low humidity, and for several hours around noon when the sea breeze dominated the sun grew intense and oxidant concentration rose. The pollution types were three: covering a large area, covering only eastern Hyogo, and localized high pollution. Type II did not occur in 1972 but appeared in 1973. For both I and II, there were some small localized low concentrations as exceptions. The pressure gradients were less than 3 mb/280 ppm for east-west, and less than 2 m/s/280 ppm for north-south.

45970 **APTIC NO. 69828**

Yanagihara, Shigeru

REACTION MECHANISM OF PHOTOCHEMICAL SMOG. *(Kokagaku sumoggu no hanno mekanizumu). Text in Japanese. Ao to Midori (Blue Green), 3(8):51-55, Aug. 1974.*

Photochemical reactions affect the bonding state of atoms and the energy level of molecules by causing changes in the state of electrons. Solar radiation consists of ultra-violet, visible, and infrared radiation. Gaseous molecules in the air absorb sunshine of specific wavelength. Nitrogen dioxide absorbs sunshine from the ultraviolet region to the visible region quite well. When NO2 absorbs sunshine below 420 nm, one of the two bondings between nitrogen and oxygen is split, releasing an oxygen atom. The oxygen atom then reacts with oxygen molecules present in the air producing ozone, which in turn reacts with nitric oxide relatively swiftly, forming NO2. If hydrocarbons are present together with nitrogen oxides in the air, O or O3 reacts with HC, thereby forming aldehydes with active radicals. Nitric oxide is oxidized to NO2 by peroxide radicals and the ratio of NO to NO2 decreases. Hydrocarbons react with NOx, inducing photochemical smog. Hydrocarbons responsible for photochemical smog include paraffins, olefins, and aromatics. Each of them is present in the air at low-level concentrations except methane (which is not very sensitive to photochemical reactions, whereas many of olefins are sensitive). Though 90% of the NOx discharged from factories is in the form of NO, NO2 is present in considerable quantity in the air. Ozone formed by photochemical reactions reacts with NO2, producing nitrogen trioxide.

45971 **APTIC NO. 68956**

Yokoyama, Osayuki

CONTROL OF AIR POLLUTION AND DIFFUSION MODELS. *(Taiki osen no seigyo to kakusan moderu). Text in Japanese. Kisho Kenkyu Noto (Meteorol. Study Note), no. 119:10-18, 1974. 18 refs.*

Practical countermeasures against air pollution require a clear understanding of the mechanism by which the concentration of pollutants varies with meteorological conditions. Diffusion of pollutants varies extensively with meteorological conditions. Control of pollutants must, therefore, be carried out in two stages. The first stage is conversion of factories to low- sulfur fuels and adoption of traffic regulations in accordance with meteorological conditions. Another stage is to maintain the concentration of pollutants discharged from factories in their normal operations below the permissible level by establishing the amount of pollutants previously emitted. Diffusion models which help to forecast diffusion swiftly and can be utilized for control of pollutants have been developed recently. Thy include a physical model and a statistical model. The physical models are classified into the box-type model, the plume model, and the puff model. The box-type model introduces an equation for the amount of pollutants flowing into and out of a box set up in an urban area and for the equilibrium concentration of pollutants inside the box. The plume model is suitable when minute changes in the concentration of pollutants in space or time are determined. The puff model deals with diffusion which occurs in unstable places.

45972 **APTIC NO. 68308**

Office of Air and Waste Management, Research Triangle Park, N. C., Office of Air Quality Planning and Standards

GUIDELINES FOR AIR QUALITY MAINTENANCE PLANNING AND ANALYSIS. VOLUME 12: APPLYING ATMOSPHERIC SIMULATION MODELS TO AIR QUALITY MAINTENANCE AREAS (FINAL REPORT). *Program Element 2AC129, Rept. EPA-450/4-74-013, OAQPS 1.2-031, 50p., Sept. 1974. 23 refs.*

NTIS: PB 237 750/AS

Data requirements, spatial and temporal resolution, reliability, and applicability to criteria pollutants such as sulfur dioxide, total suspended particulates, hydrocarbons, carbon monoxide, and nitrogen oxides are discussed for three categories of atmospheric simulation models. Categories are distinguished on the basis of their emission inventory requirements. The first model category requires only an estimate of total emissions in the air quality maintenance area, while the second category apportions total emissions into subareas within the air quality maintenance area and expresses the apportioned emissions as emission densities. The third category allows explicit treatment of point, line, and area sources of pollution. Appendices are provided with descriptions of the following models: Rollback, Appendix J HC-Ox Relationship, Miller-Holzworth, Hanna-Gifford, HIWAY, Air Quality Display, Sampled Chronological Input, APRAC-1A, and SAI Photochemical. Meteorological data requirements are also considered in relation to the dispersion models.

45973 **APTIC NO. 68543**

California Univ., Livermore, Lawrence Livermore Lab.

PROGRAM REPORT - FY 1974. ATMOSPHERIC AND GEOPHYSICAL SCIENCES DIVISION PHYSICS DEPARTMENT. *Atomic Energy Commission Contract W-7405-Eng-48, Rept. TID-4500, UC-11, 21p., Oct. 1, 1974. 59 refs.*

NTIS: UCRL-51444-74

The fiscal year 1974 research program conducted by the Atmospheric and Geophysical Sciences Division and supporting segments at Lawrence Livermore Laboratory is reviewed. Uniqud numerical modeling capabilities in use and under development are described. Specific projects are described together with an indication of significant findings of the work. Prospects for 1975 include the extension of existing work and broader application of the division s capabilities. Some of the projects being carried out include studies of mass consistent wind field modeling, atmospheric transport and diffusion, doses from pollution, boundary layer/urban heat island simulations, plume rise simulations, resuspension of surface dust, climatic impacts, a San Francisco Bay Area air pollution model, climatic effects of nuclear explosions, precipitation scavenging, and the San Bernardino forest ecosystem. Staffing and funding of the projects are mentioned. (Author abstract modified)

45974 **APTIC NO. 68958**

Central Research Inst. of Electric Power Industry, Japan

A SIMULATION OF EXHAUST GAS DIFFUSION CONSIDERING THE EFFECTS CLASSIFIED BY THE SCALE OF SOURCES OF EMISSION. *(Haien kibo betsu no eikyodo o koryo shita haien kakusan shimyureishon no kosei). Text in Japanese. Denkenho (Rep. Inst. Electr.), no. 32:6-11, Aug. 1974.*

A procedure of adopting a simulation for multiple sources of exhaust gas emission is presented. This simulation largely consists of two calculations: a calculation for the concentration of exhaust gas on the ground obtained by treating input data such as meteorological conditions and sources of exhaust gas using a fundamental simulation model; and a calculation for correction of unstable factors, in particular data on sources of exhaust gas, obtained by comparison of the real value of exhaust gas concentration with a theoretical one. An established diffusion model for a single source of exhaust gas is utilized as the fundamental simulation model. The mechanism of exhaust gas diffusion in the atmosphere consisting of an ascending process and a turbulent process which occurs afterward is treated by a calculation for ascending exhaust gas and Plume s calculation for exhaust gas diffusion either in a vertical or horizontal direction. Exhaust gas diffusion can be of five different types depending on conditions in the stratosphere. Exhaust gas diffuses in the shape of a fan, gimlet, or loop according to whether the stratosphere is stable, neutral, or unstable respectively. The type of diffusion of exhaust gas discharged from a source is determined by the scale of the source as well as by the meteorological conditions.

1973

45975 **APTIC NO. 68621**

Atkins, D. H. F. and J. A. Garland

THE MEASUREMENT OF DEPOSITION VELOCITIES FOR SULPHUR DIOXIDE AND PARTICULATE MATERIAL BY THE GRADIENT METHOD. *Preprint, World Meteorological Organization and World Health Organization, 16p., 1973. 10 refs. (Presented at the World Organization and World Health Organization Technical Conference on the Observation and Measurement of Atmospheric Pollution, Helsinki, Finland, July 30-Aug. 4, 1973.)*

The long-term transport of air pollution is controlled by the effectiveness of the mechanisms of its removal from the atmosphere, including dry deposition. The gradient method of measuring dry deposition of sulfur dioxide and particulates is described. The methods available for measuring dry deposition of SO2 and other substances and their limitations are reviewed. The chief limitation of the gradient method is the need for a very uniform terrain. Thus, deposition on hedges, small woods, or corpses cannot be measured by this technique, but it is ideal for use over extensive fields, forests, or lakes. Calculation of deposition by the gradient method, and instrumentation, analysis, and sampling of SO2 for this method are discussed. Radioactive tracers assessed the performance of the SO2 sampling method. The accuracy of the method and results of the tests are presented. The feasibility of using this method for other pollutants is mentioned.

45976 **APTIC NO. 68869**

Bacastow, Robert and Charles D. Keeling

ATMOSPHERIC CARBON DIOXIDE AND RADIOCARBON IN THE NATURAL CARBON CYCLE: II. CHANGES FROM A. D. 1700 TO 2070 AS DEDUCED FROM A GEOCHEMICAL MODEL. *Brookhaven National Lab., Upton, N. Y., Carbon Biosphere, Proc. 24th Brookhaven Symp. Biol., Upton, N. Y., 1972, p. 86-135, Aug. 1973. 47 refs. (May 16-18.)*

NTIS: CONF-720510

A nonlinear geochemical model of the interaction of atmospheric carbon dioxide with the oceans and land biota was constructed to predict future changes in the atmospheric CO2 concentration in the next century. If production of CO2 from fossil fuels continues, the perturbations from preindustrial times may become so large that a linear model is unrealistic, especially because it fails to take into account that ocean surface water will become progressively more acid and less able to absorb each new increment of industrial CO2. On the assumption that industrial CO2 production continues to increase at the rate of the past 20 years and that the ultimate increase in biomass of the land biota is no more than twice the present biomass, the atmospheric CO2 concentration will reach a value of six to eight times the preindustrial value in 100 years. When the radiocarbon concentration in dated wood and the recent atmospheric increase in CO2 are compared in the context of the model, it appears that the land biomass has increased 1-3% since the beginning of the industrial era. This calculation takes account of the actual year to year variations in industrial CO2 production and the heliomagnetic variation in radiocarbon production in the stratosphere. The inferred biomass increase, presumably due to CO2 fertilization, is too small to be verified by direct observation and is not considered to be established. On the other hand, the trend in atmospheric CO2 apparently rules out any large recent change in biomass. (Author abstract)

45977 **APTIC NO. 68540**

Beavington, F.

CONTAMINATION OF SOIL WITH ZINC, COPPER, LEAD, AND CADMIUM IN THE WOLLONGONG CITY AREA. *Aust. J. Soil Res., 11(1):27-31, 1973. 10 refs.*

Levels of atmospheric acetic acid-extractable soil zinc, lead, and cadmium, and EDTA-extractable copper were investigated from a grid sampling procedure over 56 sq km of the Wollongong (New South Wales) city area. Mean levels of these metals in four groups of urban grassland, namely, farm land, recreational land, industrial land, and roadsides, are up to 10 times greater than those in a rural control area. Highest levels of all four metals are in the Port Kembla industrial area, where 21 samples within 1 km of the main heavy metals smelting complex have mean values of 82 ppm Zn, 343 ppm Cu, 21 ppm Pb (15 samples) and 2.8 ppm Cd (11 samples); mean levels in the rural area are 2.7 ppm Zn, 5.3 ppm Cu, less than 1 ppm Pb, and less than 1 ppm Cd. Profile samples show that all four contaminants were very largely concentrated in the top 15 cm soil, confirming an air borne origin. In a wide arc of 5 km from the main heavy metals industrial complex in Port Kembla there is a significant correlation between distance and levels of extractable Zn and Cu. (Author abstract modified)

45978 **APTIC NO. 68863**

Brasseur, Guy

STRATOSPHERIC POLLUTION BY SUPERSONIC AIRCRAFT. *(La stratosphere et sa pollution par les avions supersoniques). Text in French. Rev. Soc. Roy. Belge Ingrs. Ind. (Brussels), no. 10:197, 199, 201-208, 1973.*

The problem of air pollution generated by supersonic aircraft flying at altitudes between 16 and 22 km in the stratosphere, and effect health are discussed. While carbon dioxide is one of the major emissions by supersonic aircraft, it does not exert any marked effect on the atmosphere. The water vapor emission by a fleet of 500 supersonic aircraft in service 7 hr/day could increase the stratospheric water concentration by 30% relative to the background level in 2 yr; however, the effect of such water vapor on ozone is practically negligible below the stratpause. The nitrogen oxides production by such a fleet would be equivalent by the spontaneous formation of these compounds. While a great amount of research has yet to be carried out concerning the effects of supersonic aircraft-generated emissions, the ozone layer may be considerably reduced by the nitrogen oxides emissions of supersonic aircraft, but also constant regeneration of this ozone layer is assumed.

45979 **APTIC NO. 68333**

Brimblecombe, P., J. R. Duncan, D. J. Spedding, and W. J. Thomas

SULPHUR DIOXIDE POLLUTION. *Proc. Pollut. Res. Conf., Wairakei, New Zealand, 1973, p. 305-314. 7 refs. (June 20-21.)*

Laboratory experiments were conducted to obtain information about the rate of deposition of sulfur dioxide from the air to terrestrial surfaces, the rate of oxidation of SO2 in the atmosphere and on terrestrial surfaces, and the damaging effects of increased concentrations of the gas on vegetation and metals. Sulfur dioxide uptake by aqueous solutions appears to be controlled largely by gas-phase diffusion, suggesting that the rate of SO2-uptake by the oceans is controlled simply by the rate at which gas-phase SO2 reaches the sea surface. Sulfur dioxide oxidation in the atmosphere is very complex, with the reaction being catalyzed by metal ions and its order and rate varying with pH and ionic strength. The neutralizing effect of ammonia and divalent calcium allows the oxidation rate to be maintained at a high level for some time in the presence of gaseous atmospheric NH3 or water droplets associated with fly ash. Sulfur dioxide reacts within plant leaves to form alpha-hydroxy sulfonates which inhibit the enzyme glycollate oxidase. Sulfur dioxide corrosion of iron and zinc surfaces occurs at specific sites on the metal surfaces, with the sites being activated by the presence of water. (Author abstract modified)

45980 **APTIC NO. 68859**

Broecker, Wallace S.

FACTORS CONTROLLING CO2 CONTENT IN THE OCEANS AND ATMOSPHERE. *Brookhaven National Lab., Upton, N. Y., Carbon Biosphere, Proc. 24th Brookhaven Symp. Biol., Upton, N. Y., 1972, p. 32-50, Aug. 1973. (May 16-18.)*

NTIS: CONF-720510

The factors controlling the long-term content of the atmosphere and the ocean are discussed. The main supply of carbon to the earth s surface is erosion and metamorphism of sediments. The contribution of new carbon from outer space or from deep in the mantle is probably very small. At any given time, one part in one thousand of the carbon is in the ocean-atmosphere system, and the rest is in sedimentary rocks. The distribution between these two reservoirs is determined by the time constants for the processes which destroy sediments and for those which remove things from the ocean. The carbon cycle in the ocean is examined in terms of a two-box model consisting of a warm surface ocean and a deep cold ocean separated by the main thermocline. Changes in the balance of major cations in the ocean-atmosphere system with changes in the environment are reviewed. Calcium carbonate accumulation rates and ratios of nutrient elements are discussed. The effect of calcium carbonate accumulation of the carbon dioxide content of the atmosphere is mentioned. the atmosphere is mentioned.

45981 **APTIC NO. 68598**

Burkert, Peter, Dieter Rabus, and Hans-Juergen Bolle

SPECTRAL RADIATION PROPERTIES OF THE ATMOSPHERE AND THE EARTH: PROFILES OF WATER VAPOR AND METHANE MIXING RATIOS FROM MEASUREMENTS WITH BALLOON BORNE-INSTRUMENTS (FINAL SCIENTIFIC REPORT). *Ludwig-Maximilians-Universitaet, Muenchen (Germany), Meteorologisches Inst, Air Force Grant AFOSR 72-2282, Proj. 7621-02, AFCRL-TR-74-0240, 29p., Dec. 1973. 9 refs.*

NTIS, DDC: AD-780 526

The mixing ratio of minor atmospheric constituents in the stratosphere was determined using a two channel filter radiometer. The instrument was pointed against the sun, and measured the absorption of solar radiation passing through the atmosphere in spectral regions of absorption bands. These spectral intervals were selected by interference filters and can be chosen in the infrared up to 11 micron without changing the mechanical structure of the instrument. Evaluation techniques are described and water vapor and methane profiles between 12 and 30 km altitude are shown which were derived from data of a balloon flight of April 5, 1971. (Author summary modified)

45982 **APTIC NO. 65773**

Cermak, J. E.

FLUID-MECHANICS APPLICATIONS TO PROBLEMS OF WIND FORCES ON STRUCTURES AND AIR POLLUTION. *Develop. Mech., vol. 7:37-53, 1973 (?). 36 refs. (Presented at the 13th Midwestern Mechanics Conference, Paper CEP72-73JEC57.)*

Basic research on the characteristics of thermally-stratified turbulent boundary layers developed in a long test section wind tunnel reveals a close correspondence with characteristics in the atmospheric boundary layer. Similarity parameters and boundary conditions are established which enable atmospheric boundary layers of specific thermal stratification to be simulated. The simulation is partial in the sense that full-scale Reynolds, Rossby, and Eckert numbers cannot be achieved in the wind-tunnel facilities currently available. The partially simulated natural winds for model scales ranging from 1:100 to 1:10,000 are sufficiently representative of the real atmosphere to be utilized for investigations of a wide variety of practical problems, including the wind transport of air pollutants. A 1:240 scale model of the Yerba Buena Center, San Francisco, used to study the dispersion of automobile exhausts discharged from an underground parking garage is illustrated, and examples are cited of simulated atmospheric diffusion for micro to meso-scale distances in which field data are available to confirm the model concentration distributions. (Author summary modified)

45983 **APTIC NO. 69986**

Cogley, Allen C.

LARGE-SCALE MASS BALANCE FOR LEAD IN SOUTHERN LAKE MICHIGAN (FINAL REPORT). *Illinois Univ., Urbana, Hydrosystems Lab., Department of the Interior Grant 14-31-0001-3813, Proj. A-057- ILL., UILU-WRC-74-0085, Water Resources Center Research Rept. 85, 18p., Dec. 1973. 20 refs.*

NTIS: PB-232 956

A large scale, order of magnitude mass balance for lead in the near field of Chicago is presented. Both experimental data and simple physical modeling were used to estimate the transport of Pb from the major sources to the near field sinks of southern Lake Michigan, its watershed soil, and the surroundings. The amount of Pb released into the system per year from gasoline was estimated at 8.2 times 10 to the 9th power grams. The non- automotive Pb from fixed sources was estimated at 9.25 times 10 to the 9th power grams/yr. There is a boating input of 1.43 times 10 to the 7th power grams of Pb/yr. Atmospheric transport of automotive Pb aerosols with precipitation washout is the most important mechanism for Pb input to the Lake. It is almost two orders of magnitude greater than the other mechanisms. (Author abstract modified)

45984 **APTIC NO. 68597**

Deardorff, J. W. and G. E. Willis

COMPUTER AND LABORATORY MODELING OF THE VERTICAL DIFFUSION OF NON-BUOYANT PARTICLES IN THE MIXED LAYER. *Preprint, 33p., 1973. 17 refs. (Presented at the Symposium on Turbulent Diffusion in Environmental Pollution, Charlottesville, Va., April 8-14, 1973.)*

The rate of the vertical diffusion of non-buoyant particles in the mixed layer was determined through computer and laboratory modeling. The depth of the mixed layer must be considered in a Gaussian plume model at a downstream distance from the source greater than 0.5 Uz subscript i/w asterisk, where U is the mean wind speed within the mixed layer, and that thorough vertical mixing within z subscript i first occurs at a downstream distance o about 3 Uz subscript i/w asterisk. These results apply to both weakly and strongly convective cases for which w asterisk/u asterisk exceeds about 2, where u asterisk is the friction velocity. Vertical distributions of particles as a function of dimensionless time after their release are shown for both the computer and laboratory results. Their interpretation involves the importance of the large eddies of scale comparable to z subscript i, and the tendency for updrafts to occupy less horizontal area than downdrafts. (Author abstract modified)

45985 **APTIC NO. 68746**

Frankenberg, T. T., F. E. Gartrell, and I. A. Singer (eds.)

RECOMMENDED GUIDE FOR THE PREDICTION OF THE DISPERSION OF AIRBORNE EFFLUENTS. *2nd ed., New York, American Society for Mechanical Engineers, 1973, 97p. 12 refs.*

Present technology on atmospheric dispersion is presented as a guide for engineers concerned with stack effluents who have some knowledge of the subject but are not full-time researchers or practitioners in the field. The aspects of atmospheric dispersion discussed are intended as a first approximation of simple solutions in uncomplicated terrain. Ordinary continuous stack emissions are emphasized, and while other problems may be mentioned, none are treated fully. The meteorological fundamentals of wind, stability, and turbulence are discussed. The behavior of airborne effluents from a typical continuous stack source over local terrain, plume behavior as a function of initial source parameters, and the influence of buildings and irregular terrain are discussed. Calculations of effective stack height and dispersion and deposition are described. Sources of data and experimental methods such as meteorological measurements, field tracer studies, and wind tunnel experiments are discussed. Calculation methods and examples are given.

45986 **APTIC NO. 68981**

Georgii, H. W.

PROBLEMS OF GLOBAL AIR POLLUTION. (Fragen globaler Luftverunreinigung). Text in German. Ann. Meteorol., vol. 6 or 8:147-149, 1973. 11 refs.

The long-term and indirect effects of global air pollution are discussed. The increase in the yearly growth rate of the carbon dioxide concentration from 0.7 ppm in 1968 to 1.1 ppm currently is due only partly to anthropogenic effects. The CO2 levels of 375 ppm, as expected for 2000, is assumed to cause an 0.5 C increase in the temperature. However, the increase in the tropospheric water vapor content, a consequence of the increased CO2 level, would result in increased cloud cover and hence in a decrease in the temperature. The increase of the stratospheric water vapor content is believed to enhance cirrus formation. The influence of carbon monoxide on the ozone layer is negligible on a global scale. Sulfur dioxide, nitrogen oxides, ammonia, and hydrocarbons play an important role in atmospheric aerosol formation, especially when involving photochemical processes.

45987 **APTIC NO. 68353**

Hay, Donald R. and Victor E. Sells

LIDAR STUDY OF ATMOSPHERIC PARTICULATE OVER THE CITY OF LONDON. *Atmosphere, 11(3):97-105, 1973. 17 refs.*

The laser radar (lidar) is capable of detecting weak concentrations of particulate in the lower atmosphere at ranges up to several kilometers. Through this technique, models of thermal convection and theories of particulate diffusion may be studied by observing the spatial and temporal changes in particulate concentration. A pulsed ruby lidar was assembled with scanning optics located at an elevated position overlooking the city of London, Ontario. Criteria were evolved for deriving profiles of extinction coefficient and particulate number and mass concentration from the lidar signatures. Sample profiles of particulate concentrations are given for comparison with the design prediction of lidar sensitivity. (Author abstract)

45988 **APTIC NO. 68349**

Hess, Paul E. and Marvin L. Wesely

DIGITIZATION OF ACOUSTIC SOUNDER DATA. *In: Radiological and Environmental Research Division Annual Report. Atmospheric Physics. January through December 1973. Argonne National Lab., Argonne, Ill., p. 85-92, 1973. 6 refs.*

NTIS: ANL-8060, Part IV

In order to record acoustic sounder data quantitatively, store it in compact, retrievable and computer-compatible form, or transmit it from remote locations, digitization of the information is desirable. A preliminary interpretation of digitized sounder information is presented, and some methods of presenting the digital transcriptions graphically are given. Digitization of acoustic sounder echo signals represents a significant improvement over strip-chart recording in that the information is recorded in a qualitative form that simplifies retrieval for processing. However, for continuous operation, the digitizing equipment should be more reliable than that patched together for this preliminary study. Punched paper tape is not an adequate medium for recording the large amounts of data likely to accumulate, especially when more than one sounder is used. Storage on magnetic tape, direct transmission to a computer for storage, or real-time processing of the signal, would be more efficient alternatives. For climatological studies, the data could be compactly stored on magnetic tape. Some data could be determined with suitable computer programs rather than by the laborious visual inspection required by strip-chart recordings. Through digitization of the magnitudes of the echo signals, the amount of backscattered acoustic energy received with a calibrated sounder system could be calculated. Thus, with proper interpretation of the backscattering mechanisms, objective measures of inversion strengths could be determined. Digitization will allow remote interrogation over commercial telephone lines. Trends in inversion heights over a large geographical area could be detected. By defining the volume of atmospheric available for dispersal, digitization could be used to predict regional pollution levels. Ultimately, the prediction of regional pollution levels and the determination of short-time fuel-switch strategies could be based on data collected from a network of unmanned acoustic sounding sites. (Author conclusions modified)

45989 **APTIC NO. 68367**

Hicks, Bruce B.

ON THE STABILITY DEPENDENCY OF ATMOSPHERIC DISPERSIVE PROPERTIES NEAR THE SURFACE. *In: Radiological and Environmental Research Division Annual Report. Atmospheric Physics. January through December 1973. Argonne National Lab., Argonne, Ill., p. 55-67, 1973. 11 refs.*

NTIS: ANL-8060, Part IV

The extent to which current micrometeorological knowledge can be used to describe the relevant turbulence statistics near the surface is illustrated using recent data obtained over Lake Michigan. Appended are a few examples of the manner in which changes in the surface roughness influence the magnitude of the angular dispersive properties of the wind in the horizontal plane at low levels. Careful examination of the individual stability dependencies of the drag coefficient and of the standard deviation of fluctuations in the vertical wind component/the friction velocity suggests that these two influences have a similar effect upon the angular dispersive properties of the wind in the horizontal and vertical planes. Thus, knowledge of each can contribute to the prediction of the angular dispersive properties of wind. Once sufficient information regarding the stability dependence of the drag coefficient and of the velocity turbulence statistics is available, prediction of the appropriate values of the angular dispersive properties of the wind for application near the surface presents few problems. All of the arguments given apply only to the surface boundary layer; it is only within this layer of relatively constant flux that bold statements can be made about the stability influences on the drag coefficient and the turbulent properties.

45990 **APTIC NO. 68396**

Mason, James B.

LIDAR MEASUREMENT OF TEMPERATURE: A NEW APPROACH. *United States Army Electronics Command, White Sands Missile Range, N. Mex., Atmospheric Sciences Lab., Task IT061102B53A-19, Rept. ECOM-5506, OSD-1366, 23p., Sept. 1973. 11 refs.*

NTIS, DDC: AD 767526

The use of lidar differential absorption to obtain measurements of a gas temperature is possible since individual line strengths in weak molecular absorption bands can be probed using a suitable laser source. Based on the assumption of monochromatic laser emission, a simple expression is derived that gives temperature in terms of only constant line parameters and ratios of measure power returns; hence, no independent reference measurement is required. The approach is not restricted to any particular wavelength region, but does require accurate information on the rotational lines to be probed. Sensitivities of the approach are considered sufficient for profile measurements of the temperature in the atmosphere.

45991 **APTIC NO. 54153**

Matsuzaki, T., M. Ohkoichi, and M. Udo

AIR POLLUTION DIFFUSION SIMULATION ON COMPUTER GRAPHICS FOR URBAN SYSTEM DEVELOPMENT–VALIDATION AND SENSITIVITY ANALYSIS IN HIMEJI CITY. *(Taiko osen kakusan ni shimureshon to komputa gurafikkusu–shan shisutemu no kaihatsu o mezashite). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, p. 271-274, 1973. 3 refs. (Presented* *at the Japan Society of Mechanical Engineers, 51st Meeting, Fukuoka, Japan, Oct. 16-17, 1973, Paper 617.)*

A study of the validation and sensitivity analysis of the Gaussian plume multiple source diffusion model is presented. Comparisons were made of the short and long term sulfur dioxide concentrations calculated by the computer simulation model with measured pollution concentrations at five sampling stations in Himeji City. The diffusion model will be used for long term urban planning purposes along with associated application programs. The diffusion formula has worked very well to describe the cause and effect relationship between emission sources and ambient air quality level in an urban region. Sulfur dioxide diffusion from a hypothetical stack and the effect of local meteorology on the ground level SO2 concentrations were also simulated.

45992 **APTIC NO. 68863**

McClatchey, R. A. and R. W. Fenn

VISIBLE AND INFRARED EFFECTS OF MOLECULAR AND PARTICULATE B-1 EMISSIONS. *In: Environmental Impact of B-1 Emissions in the Stratosphere. Air Force Cambridge Research Labs., Bedford, Mass., Proj. 86050801, DOD Element 61102F, AFCRL-TR-73-0608, AFSG 275, p. 15-19, Oct. 10, 1973. 3 refs.*

The impact of exhaust emissions in the stratosphere in changing the absorptive properties of the stratosphere for ultraviolet, visible, and infrared radiation and in changing weather and climate due to altered atmospheric heating and cooling effects brought about by the radiative absorptive properties of the stratosphere is discussed. The abundance of natural stratospheric aerosols during nonvolcanic conditions may be expected to be as low as 5 times 10 to the 5th power particles/sq cm. Even then, particulates and molecular emissions from B-1 aircraft consisting of water, carbon dioxide, carbon monoxide, sulfur dioxide, nitric oxide, and particulates would still be only about 0.5% of the lowest natural level. The abundance of naturally occurring methane in the stratosphere is 2 times 10 to the 18th power molecules/sq m. The strongest band intensity of methane is 3018.92/cm and has a value of 1.21 times 10 to the -17th power/cm/mol/sq cm. The weak absorption parameter is 24. The abundance of hydrocarbons from the B-1 fleet is estimated as 8.7 times 10 to the 11th power molecules/sq m. A value of 1.21 times 10 to the -17th power is estimated for the band intensity. The weak absorption parameter is 10 to the -5th power. The emitted hydrocarbons have an absorption which is about six times less than the absorption of the methane naturally occurring in the stratosphere. A comparison of the absorption intensities of sulfur and nitrogen oxide pollutants with those of water showed no infrared heating or cooling would be contributed when compared with the result from the 6.3 micron H2O band. Changes in the stratospheric water vapor, the solar constant, and the natural abundance of CO2 and probably other naturally occurring atmospheric gases and particulates, are most likely orders of magnitude greater than the heating contribution of B-1 emissions. Thus, the contribution to atmospheric heating and global weather and climate resulting from the proposed fleet of 241 B-1 aircraft would cause a change of less than 0.5%, even under the worst condition.

45993 **APTIC NO. 68368**

Miller, Edward L.

A PRELIMINARY COMPARISON OF ACOUSTIC SOUNDER RECORDS AND HIGH- RESOLUTION PROFILES OF TEMPERATURE AND WIND. *In: Radiological and Environmental Research Division Annual Report. Atmospheric Physics. January through December 1973. Argonne National Lab., Argonne, Ill., p. 78-84, 1973. 6 refs.*

NTIS: ANL-8060, Part IV

A preliminary comparison was made of an acoustic sounder record to reveal atmospheric structure with simultaneously obtained profiles of wind and temperature at the same location, measured by a high-resolution radiosonde system. The ability of the acoustic sounder to reveal rapid changes in inversion height was demonstrated. The hypothesis that acoustic echoes from stable regions are produced only in those parts of the region that also have sufficient wind shear was supported by these measurements. The strength of that support was limited by uncertainties of the same order of magnitude as the distances involved in determining which parts of the region contained wind shear. (Author conclusions modified)

45994 **APTIC NO. 68531**

Miura, Shiro

THE RELATIONSHIP BETWEEN ATMOSPHERIC OZONE AND WEATHER. *(Taiki ozon to kisho no kakawariai (1)). Text in Japanese. Tokan Gijutsu Nyusu (Tokan Technol. News), no. 31:17-21, June 1973. 7 refs.*

The ozone in this review refers to natural O3 in the lower stratosphere rather than oxidant. The behavior of atmospheric O3 as a tracer is studied for the purpose of investigating the structure of the lower stratosphere and the mechanism of atmospheric circulation. The theory and procedure for O3 measurement by photometric (Dobson s spectrometer) and chemical (sodium iodide method) methods are reviewed. The vertical distribution of O3 calculated based on the photochemical theory deviates from the measured value. The time required to attain equilibrium value for the deviated value due to atmospheric disturbance increases exponentially with decrease in altitude; one day at 40 km altitude, 10 days at 30 km, and 1000 days at 20 km. Therefore, the O3 concentration at lower altitudes is governed by atmospheric motions rather than photochemical reactions. The variations in total O3 with latitude and seasons are analyzed using data obtained by Yodson, which also indicates that variation in total O3 is governed by atmospheric motions. The survey conducted by Shimizu in 1958 indicated that the increase and decrease in total O3 corresponded to the valley and peak of pressure, respectively. The position of the maximum wind velocity zone at 200 mb showed a similar tendency with variation in O3 concentration. Ozone density is charted from ground level to 40 km for winter and summer.

45995 **APTIC NO. 69818**

Nakashima, Nobutaro

WEATHER AND AIR POLLUTION OF THE INLAND SEA. *(Seto Naikai no kisho to taiki osen). Text in Japanese. Kisho Gijutsu Noto (Meteorol. Study Note), 14(1-2):72-73, Dec. 1973.*

The meteorological characteristics of the Inland Sea closely affect the air pollution characteristics of the area. The wind velocity is low generally throughout the Inland Sea, but specially in Kure in Hiroshima Bay which is surrounded by mountains and the climate is the typical basin weather. Inversions appear often in the lower atmosphere in the winter. The peaks of sulfur dioxide concentration appear in the morning, and daily fluctuations are quite regular. Forecasting and control are relatively easy. Otake is situated on the opposite shore of Kure and has factories along the coast. Sea breezes transport air pollutants into the city. In winter, the predominant wind is westerly in Otake, but high pollution occurs on days with weak southeast sea breezes. The peaks appear 1-2 hours later than Kure, close to noon. Hiroshima is located at the deepest base of Hiroshima Bay, and the most dominant wind through the year is north-northeast. Sea breezes come from southwest, especially in summer at a considerable speed. Therefore, pollutants emitted by the shoreline sources penetrate inland. In the Mizushima industrial Area in the center of the Inland Sea, the dominant winds are west-southwest to east- northeast. Rather strong sea breezes from spring to summer often result in heavy pollution. The atmospheric stability is lost often in the afternoon in the upper layer due to numerous high stacks, and the ground pollution tends to increase.

45996 **APTIC NO. 68882**

Pasic, H.

AIR POLLUTANT DISPERSION IN DIFFERENT TYPES OF WEATHER IN SARAJEVO. *(Verbreitung der Luftverunreinigungen in Sarajevo bei verschiedenen Wettertypen). Text in German. Ann. Meteorol., vol. 6 or 8:157-159, 1973. 8 refs.*

Relationships between certain meteorological factors and the dispersion of sulfur dioxide and soot were studied in Sarajevo, Yugoslavia, a town situated in a depression surrounded by high mountains. Ground-level inversions, fog, and cold air islands in winter are the principal characteristics of the weather in Sarajevo. The absence of vertical transport, cold air masses at ground-level, and negative temperature gradients, all occurring frequently in winter account for high SO2 and dust concentrations due to inhibited dispersion, especially in the center city and in narrow streets, causing SO2 and soot concentrations to rise to values as high as 2.8 mg/cu m and 1.8 mg/cu m, respectively. A close relationship between the temperature gradient and the air pollution levels in winter was established. Both the SO2 and soot concentrations were too low to be detectable in the summer period, which is partly due to turbulence and positive temperature gradients.

45997 **APTIC NO. 68862**

Paulson, John F.

EFFECTS OF THE B-1 ON OZONE AND ON TRANSMITTED UV. *In: Environmental Impact of B-1 Emissions in the Stratosphere. Air Force Cambridge Research Labs., Bedford, Mass., Proj. 86050801, DOD Element 61102F, AFCRL-TR-73-0608, AFSG 275, p. 7-14, Oct. 10, 1973. 13 refs.*

The effects of nitrogen oxides on the formation and destruction of ozone are discussed, and the chemical reactions and mechanisms involved in the catalyzed ozone destruction in the stratosphere are described. Two arguments have been given in opposition to the predictions of Johnston and Crutzen regarding catalytic destruction of ozone by NOx. The first is that the transport processes were not adequately considered. The second resulted from studies of the effects of nuclear explosions on NOx in the troposphere which concluded that there was no evidence for a large ozone decrease following the large nuclear test series in 1961 and 1962, and thus the O3 content of the atmosphere is probably not sensitive to the amount of NOx produced. Various arguments for and against these theories and those of Johnston and Crutzen are discussed. The possible environmental effects of the proposed B-1 fleet are compared with those predicted for supersonic aircraft under worst case conditions. The B-1 fleet would produce 0.000333 times as much nitric oxide as the SST fleet. The catalytic ratio for the B-1 fleet is then 0.000333 times that for the SST fleet, and the ozone destruction rate is 0.000333 times as great. The ozone column density is, therefore, reduced by a factor only 2% as large for the B-1 fleet as for the SST fleet. These figures assume no NOx present in the stratosphere before aircraft NOx injection. Using realistic estimates of normal ambient NOx of 3-30 ppb, the B-1 fleet would increase NOx by only 0.001 ppb and would, therefore, lead to negligible changes in the ozone column density. A recent estimate indicates that the NOx added by the projected SST fleet would be approximately the same as that present in the normal atmosphere. Under such conditions, the O3 density would be reduced by 30% and the ozone reduction by the B-1 fleet would be 0.0125%. Thus, B-1 impact on stratospheric O3 and on transmitted ultraviolet radiation would be negligible, provided that the projected flight times in the stratosphere and engine emissions levels used in the estimations are realistic.

45998 **APTIC NO. 68380**

Rao, C. R. Nagaraja, T. Takashima, and R. B. Toolin

MEASUREMENTS AND INTERPRETATION OF THE POLARIZATION OF RADIATION EMERGING FROM THE ATMOSPHERE AT AN ALTITUDE OF 28 KM OVER SOUTH- WESTERN NEW MEXICO (USA). *Quart. J. Roy. Meteorol. Soc. (London), 99(420):294-302, April 1973. 21 refs.*

The degree of linear polarization of the upward radiation emerging from the atmosphere at an altitude of 28 km was measured over south-western New Mexico with a balloon-carried photoelectric polarimeter. Measurements were made at four spectral intervals (bandwidth approximately 15 nm) centered on lambda lambda 362, 401, 501, and 599 nm. The turbidity factors of simple homogeneous models of turbid atmospheres were estimated from a comparison of the experimental results with computed values of the polarization of the radiation emerging from the top of the model atmospheres. The computations were based on the solution of the radiative transfer problem in a homogeneous turbid atmosphere. The doubling method was used to obtain the solution. The optimal values of the turbidity factors required to establish good agreement between theory and experiment vary directly as the phase function asymmetry factors associated with the two types of aerosols used in the models. The uncertainty in the interpretation of the polarization data due to the similar effects that the atmospheric aerosols and the unpolarized part of the radiation reflected by the ground have on the polarization of the scattered radiation is discussed. (Author summary modified)

45999 **APTIC NO. 68648**

Reiter, Elmar R.

AGE ESTIMATES OF STRATOSPHERIC AIR. *Colorado State Univ., Fort Collins, Dept. of Atmospheric Science, Atomic Energy Commission Contract AT (11-1) - 1340, ATS 206, Rept. CSU - ATSP, 15p., Aug. 1973. 7 refs.*

NTIS: COO-1340-35

The ratio of phosphorus-32 to beryllium-7 (both isotopes being generated in the atmosphere by cosmic radiation) is mathematically shown to yield information on the stratospheric or tropospheric origin of air masses. The determination of this ratio for massive and rapid extrusions of stratospheric air, especially those linked to jet maxima and cyclogenetic processes, also appears to offer a powerful tool in determining quantitatively and directly the residence times of air masses in the lower stratosphere, particularly in the polar front belt of middle latitudes. Preliminary data show relatively high P/Be ratios in the summer and relatively low ratios in the spring. The tentative interpretation of these data is that a higher proportion of young stratospheric air is involved in the stratospheric air extrusions of summer than in spring. This is in agreement with the fact that during spring the stratosphere shrinks in size. Well-organized vertical transport processes also lead to massive infusions of ozone and nuclear debris from the stratosphere to the troposphere. During summer and autumn, the stratosphere increases its mass content by a gradual lowering of the tropopause. Extrusions of stratospheric air near jet streams during these seasons most likely involve air masses which have been incorporated into the stratosphere only recently.

46000 **APTIC NO. 68353**

Sells, V. E. and D. R. Hay

LIDAR EVIDENCE OF THERMAL PLUMES IN AN URBAN ENVIRONMENT. *Atmosphere, 11(4):162-165, 1973. 17 refs.*

A laser radar (lidar) operating at the ruby line 0.6943 micron was used to observe horizontal profiles of particulate concentration in the air some 30 m above the surface within the city of London, Ontario over a period of one year. Anomalous features in these profiles were interpreted as natural thermal plumes carrying particles upwards from surfaces such as paved roadways, paved parking lots, treed parks, residential construction sites, open ploughed fields, and the river. Insolation of the ground is required for their formation, and neutral thermal stability aloft favors their incidence. (Author abstract)

46001 **APTIC NO. 68864**

Shapiro, Ralph

ASSESSMENT OF THE IMPACT OF THE B-1 EXHAUST EMISSIONS ON LOCAL AND GLOBAL CHANGES IN WEATHER. *In: Environmental Impact of B-1 Emissions in the Stratosphere. Air Force Cambridge Research Labs., Beford, Mass., Proj. 86050801, DOD Element 61102F, AFCRL-TR-73-0608, AFSG 275, p. 21-30, Oct. 10, 1973. 14 refs.*

The results of simulation model studies of the impact of emissions from B-1 aircraft on local and global changes in weather are discussed. Although the simulation studies carried out to date have not been based on models ideally designed to investigate B-1 or SST impact on the atmosphere, they have been carried out on a variety of the most sophisticated global models of the atmosphere available today. The direct effect of B-1 emissions would be to affect stratospheric radiative, chemical, and photochemical processes. Although the experiments discussed did not incorporate such direct effects, they do simulate the type of indirect changes in heat balance and temperature distribution which might ulitmately arise. The results of all the experiments are consistent in indicating there is little likelihood of any long-term global impact on the climate as a consequence of B-1 operations, though there might be some small, transient local weather effects. This conclusion will probably be sustained by more rigorous experiments which will be conducted, unless some completely unanticipated atmospheric instability is uncovered. (Author conclusions modified)

46002 **APTIC NO. 68632**

Spriggs, William A.

LARGE PARTICLE DIFFUSION FROM AN ELEVATED LINE SOURCE – A COMPARATIVE EVALUATION OF A THEORETICAL MODEL WITH FIELD DIFFUSION EXPERIMENTS. *Agr. Meteorol. (Amsterdam), vol. 12:425-439, 1973. 22 refs.*

A theoretical model of atmosperic diffusion of a polydispersed material from an elevated line source was used to predict downwind deposition of large particles (nominally 100 micron in diameter) released during six separate field diffusion experiments. Two equations were used. In the first, diffusion was dependent on the distribution of particles as advected in a steady-state condition. The second included factors to account for atmospheric turbulence and diffusion. When the correct equation was chosen for a given turbulence condition, in all but two of the diffusion trials the model was within 5 m of predicting the point of maximum deposition; in all six trials the greatest discrepancy was 15 m. The model was reasonably capable of predicting values of downwind deposition. Wind profile fitting terms were most accurate under thermally stable atmospheric conditions. Line source models can be practically used for aircraft and surface transportation emission problems. (Author abstract modified)

46003 **APTIC NO. 68865**

Stergis, C. G.

SUMMARY: EFFECT OF THE B-1 ON STRATOSPHERIC OZONE. *In: Environmental Impact of B-1 Emissions in the Stratosphere. Air Force Cambridge Research Labs., Bedford, Mass., Proj. 86050801, DOD Element 61102F, AFCRL-TR-73-0608, AFSG 275, p. 31-35, Oct. 10, 1973.*

The effects of nitrogen oxides on ozone in the stratosphere are discussed. Oxides of nitrogen normally present in the stratosphere have been estimated to reduce the ozone concentration by a factor of two over the concentration that would be present with no NOx. Recent estimates indicate that the NOx that would be added by the projected SST fleet is approximately the same as the amount normally present in the stratosphere, and under such conditions ozone would be reduced by approximately 30%. Since a B-1 fleet consisting of 241 aircraft would produce 0.000333 times as much nitric oxide as the projected SST fleet, the ozone concentration would be reduced by 0.0125%. The emitted amounts of water, carbon dioxide, carbon monoxide, and particulates from a fleet of B-1 aircraft into the atmosphere would be three to five times less than the abundances naturally present in the stratosphere. A comparison is given of the absorption effects of these molecules. The contribution of the projected B-1 fleet to the absorption and scattering properties of the stratoesphere is estimated as less than 0.5% even under the worst conditions. Simulation studies of the effects of B-1 operations show there is little likelihood of any long-term global impact on the climate, though there might be some small, transient, local weather effects.

46004 **APTIC NO. 68861**

Stergis, C. G.

ENVIRONMENTAL IMPACT OF B-1 EMISSIONS IN THE STRATOSPHERE. INTRODUCTION. *In: Environmental Impact of B-1 Emissions in the Stratosphere. Air Force Cambridge Research Labs., Bedford, Mass., Proj. 86050801, DOD Elements 61102F, AFCRL-TR-73-0608, AFSG 275, p. 5-6, Oct. 10, 1973. 1 ref.*

The environmental impact of a fleet of B-1 aircraft flying in the atmosphere on local and global changes in weather, radiation, and stratospheric ozone concentrations will be discussed in several papers. The emission characteristics of a B-1 fleet of 241 aircraft flying a total of 650 hr/yr in the atmosphere are compared to those of a fleet of 500 SST aircraft.

46005 **APTIC NO. 68858**

Stuiver, Minze

THE 14C CYCLE AND ITS IMPLICATIONS FOR MIXING RATES IN THE OCEAN-ATMOSPHERE SYSTEM. *Brookhaven National Lab., Upton, N. Y., Carbon Biosphere, Proc. 24th Brookhaven Symp. Biol., Upton, N. Y., 1972, p. 6-20, Aug. 1973. 27 refs. (May 16-18.)*

NTIS: CONF-720510

Residence times and exchange rates for carbon in major carbon reservoirs are derived from box-model studies of carbon(14) activity ratios. A diffusion-advection model is presented which gives information on oceanic mixing processes and the oceanic transport of carbon of biological origin. Literature associated with this type of global study of carbon transfer and storage is summarized. (Author abstract modified)

46006 **APTIC NO. 68826**

Wade, Gerald T., Teddy L. Barber, and Robert Armstrong

A PROPOSED VERSATILE PHOTON COUNTER SYSTEM FOR LASER RADAR. *Army Electronics Command, White Sands Missile Range, N. Mex., Atmospheric Sciences Lab., DA Task 1T061102B53A-19, Rept. ECOM-5508, 21p., Sept. 1973. 17 refs.*

NTIS, DDC: AD 766678

A high-speed, multi-channel photon counting system was proposed for use with a variety of laser radar (lidar) experiments. It utilizes two solid state buffer memories to replace the large array of counters normally associated with such a system and a minicomputer to handle data manipulation and display. The speed and versatility make the system a reasonable alternative to systems presently in use. System features include a 250 MHz photon counting rate, 100 nanosecond minimum sample interval, up to 512 channel data accumulation with sub-nanosecond switching times between channels, and a maximum laser transmitter repetition rate of 10 KHz. This system offers several advantages over presently available systems, such as allowing the higher laser repetition rates needed to monitor a rapidly fluctuating atmosphere without sacrificing spatial resolution or the total number of data channels, and enabling real-time modification of the system operating parameters as a function of incoming data. The parameters influencing the design of such a system are described. The system can be used to study the vibrational and pure rotational Raman returns from the atmosphere and the spectral lineshape of atmospheric Rayleigh scattering as possible temperature and wind probing techniques. (Author abstract modified)

46007 **APTIC NO. 68322**

Werner, Christian

THE BASIS OF A RAMAN LIDAR SYSTEM. *(Grundlagen fuer ein Raman-Lidar-System). Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany), Inst. fuer Physik der Atmosphaere, DLR-MITT 73-19, 1973, 13 refs. Translated from German. European Space Research Organisation, ESRO-TT-21, 31p., Feb. 1974.*

NTIS: N74 22183

To determine the water vapor/nitrogen ratio in the upper atmosphere, parameters were calculated for a Raman lidar system. The measurements were used to determine the limitations of the system. Model calculations were used to determine the ranges of various systems using different lasers and telescopes. A distinct aerosol effect on the measurements was found. After extensive calculations with the aid of standard distributions of aerosol, nitrogen, and water vapor in the atmosphere, and taking into account the backgroupd radiation, a system was calculated which makes it possible to measure the mixture ratio continuously up to an altitude of a few km. The aerosol effect on the extinction of the laser beam is left out of consideration. Since this influence is small in the case of simultaneous measurement and formation of the ratio, the mixture ratio can still be determined. Absolule measurements of the temperature or water vapor will continue to be imperfect, however. (Author summary modified)

46008 **APTIC NO. 68682**

Yamagata, Hideo and Shohei Shinagawa

RECENT AIR POLLUTION CONDITIONS IN OITA. *(Oita-shi no saikin no taiki osen ni tsuite). Text in Japanese. Fukuoka Kanku Kisho Kenkyukai-shi (Proc. Fukuoka District Meet. Study Meteorol.), no. 34:143-146, Oct. 1973.*

The enforcement of air pollution control in Oita Prefecture was improved in 1972. The data of the Prefectural environmental control office for April 1972 to March 1973, and data at the New Japan Ironworks for Aug. 1972 and April 1973 were studied to see the relationship between air pollution and weather factors. At the New Japan Ironworks, a new blast furnace collective stack (200 m) was constructed in 1971, and thermistats were installed on five levels of the stack. The state of ground inversion and contributing factors, and the relationship between local winds and pollution were studied from the data. Generally, the sulfur dioxide concentration was higher between June and August. The daily peak formed from noon to evening in all areas, but the time tended to lag farther away from emission sources. High pollution occurred when the wind was between north and west, the velocity 2-4 m/sec, on sunny days. When a mobile high pressure system was passing near Kyushu, high pollution occurred frequently. Among the data on inversions, the frequency of more than 5 C temperature inversions was 80-90% for spring, summer, and fall, and slightly less for winter. Intense ground inversions occurred between 5-7 pm. in summer and fall. The appearances of sea breeze and ground inversion seemed to be closely related. As a method of predicting SO2 mass stagnation, the location of high pressure, the intensity of inversion, and the rise of sea breezes after dissolving of inversion should be further studied and coordinated.

46009 **APTIC NO. 68729**

Kanagawa Prefectural Government (Japan)

THE RELATIONSHIP BETWEEN THE WEATHER OF KANAGAWA PREFECTURE AND POLLUTANTS IN KEIHIN INDUSTRIAL BELT. *(Kanagawa-ken no kisho oyobi Keihin kogyo chitai no osenshitsu to no kankei). Text in Japanese. Kanagawa-ken Taiki Osen Choss Kenkyu Hokoku (Tech. Rept. Air Pollution Yokohama-Kawasaki Ind. Area), no. 15:68-126, Feb. 1973.*

The monthly summary of general weather conditions in Kanagawa Prefecture from January to December 1971, the weather characteristics at 31 measuring points, and the seasonal characteristics of wind directions are described. The monthly average lapse-rate of air temperature indicated that the lapse-rates were higher than 1 C between 9 am and 3 pm and the inversion was observed only in November. The monthly average temperature inversion occurred in less than half of the days in a year, and was in the range of -1.0 to 4.0 C (80% in the range of 0.0 to 0.9 C). The locations of high sulfur dioxide concentration (higher than 0.10 ppm) and oxidant concentration higher than 0.1 ppm) appear with the most frequent wind directions, average wind velocity, wind rose, and general weather of the day. The wind direction contributing to the high SO2 concentration is the opposite of the wind direction associated with high oxidant concentration. The SO2 concentration is affected primarily by the land breeze, indicating that the pollutant sources are located at the inland area.

1972

46010 **APTIC NO. 68372**

Beaton, J. L., A. J. Ranzieri, E. C. Shirley, and J. B. Skog

AIR QUALITY MANUAL. VOL. IV. MATHEMATICAL APPROACH TO ESTIMATING HIGHWAY IMPACT ON AIR QUALITY (INTERIM REPORT. JUNE 1971 THRU APRIL 1972). *California Dept of Public Works, Sacramento, Div. of Highways, Federal Highway Administration Contract FH-11-7730, Work Unit FCP 33F3032, Rept. FHWA-RD-72-36, Rept. CA-HWY-MR6570825 (4)-72-08, 70p., April 1972. 22 refs.*

Highway engineers have to consider a variety of factors in the environmental impact of any highway project and complete a number of studies prior to writing an impact statement. One of these studies is concerned with the gathering of field data, analysis of such data, and writing an air quality report. A method of predicting pollutant concentrations within an area of study with and without the new highway is explained. The prediction analysis includes both the highway corridor and the mesoscale. The highway corridor is defined as a region extending from the point where the pollutants are generated by traffic (the highway) downwind to the point where ambient pollutant levels are again reached. The mesoscale area is defined as the area throughout which traffic volumes on the surface traffic network are significantly affected by the construction of a new highway. The input data required for mathematical analysis of the corridor includes traffic data, emission factors, wind speed, wind direction, stability, type of highway design, and horizontal and vertical dispersion patterns. Calculations are given for crosswinds and parallel winds. Superposition with cross of parallel wind conditions and mesoscale analysis are also discussed. (Author abstract modified)

46011 **APTIC NO. 68811**

Nadezhina, Y. D.

INTERACTION OF DYNAMIC AND THERMAL PROCESSES IN THE TRANSPORT OF AIR MASSES. *(O vzaimodeystvii dinamicheskogo i teplogo protsessov pri transformatsii vozdushnoy massy). Text in Russian. Tr. Glav. Geofiz. Observ. Leningrad, no. 282:71-78, 1972. 7 refs.*

Mathematical investigations into the interaction of dynamic and thermal processes in the transformation of air masses as a function of changes in surface roughness and surface temperature are presented. Changes in the surface roughness have little effect on the temperature profile because the temperature changes inside the transformed air mass are determined by the conditions prevailing at the upper and lower boundaries. The gradual increase of the energy in the lower layers implies intensification of unstable stratification. A simultaneous increase in the surface roughness and surface temperature has an even more pronounced effect. A reduction of the surface roughness and a rise in temperature results in a substantial change in the turbulent energy profile. The findings indicate the essential influence of surface roughness on turbulent flow processes.

46012 **APTIC NO. 68893**

Sidorenko, V. F., Y. G. Pel dman, G. P. Kirillov, and V. A. Maksimova

A METHOD OF MODELING TO STUDY THE DISSEMINATION OF MOTOR VEHICLE EMISSIONS IN HOUSING COMPLEXES. *(Metod modelirovaniya pri issledovanii rasprostraneniya vybrosov avtoransporta v zhiloy zastroyke). Gigiena i Sanit., 1972:9-12, May 1972. 3 refs. Translated from Russian. Scientific Translation Service, Santa Barbara, Calif., 6p. 3 refs.*

Scale models of buildings (1:10 scale) were used to study the effect of different construction patterns on the dissemination of motor vehicle emissions around housing complexes. An internal combustion engine was used as the pollution source, with exhaust gas being fed to several points through metal pipes. Analysis was performed on 2000 air samples, and gas concentration charts were prepared for each type of housing pattern investigated. The lowest air pollution indices were found in combined frontal and endwise construction. A four-section building, fronting the roadway, created a large zone of low exhaust gas concentration within the housing complex. Endwise construction permitted polluted air currents from the roadway to freely penetrate intra-block territory. Placement of buildings at a 45-degree angle to the roadway resulted in gas penetration patterns similar to those observed in endwise construction. A slight stagnation of air currents was found in the front of buildings situated in a frontal arrangement. Concentrations of exhaust gas reached 90% of their initial values along the facade of the buildings (placed 50 m away from the roadway) and 55% of their initial level behind the buildings. The zone of contact of polluted air with the underlying surface, penetrating the buildings from above, was 4-5 building heights high.

1969

46013 **APTIC NO. 69170**

Kondrat ev, K. Y. (ed.)

RADIATION CHARACTERISTICS OF THE ATMOSPHERE AND THE EARTH S SURFACE. *(Radiatsionnye kharakteristiki atmosferry i zemnoi poverkhnosti). Leningrad, Gidrometeorologicheskoe Press, 1969, 642 refs. Translated from Russian by Vijay Pandit, Amerind Publishing Co. Pvt. Ltd., New Delhi, India, 597p., 1973. (Translated for the National Aeronautics and Space Administration and the National Science Foundation, Washington, D. C., NASA TT F-678, Category-13.)*

NTIS: TT 71-58003

The radiation characteristics of the atmosphere and the earth s surface are described. The structure and compositon of the atmosphere is discussed including gases such as water vapor, ozone, carbon dioxide, methane, and oxides of nitrogen and atmospheric aerosols. Specific aerosol topics include the vertical distribution of the aerosols, size distribution, sources, and aerosol models. The coefficient of absorption of atmospheric gases in the visible and ultraviolet regions of the spectrum are presented for oxygen, molecular nitrogen, nitric oxide, O_3, and H_2O vapor. The optical characteristics of the atmospheric gases in the ultraviolet region of the spectrum are presented for H_2O vapor, CO_2, O_3, CH_4, nitrous oxide, and carbon monoxide. Other topics discussed include: characteristics of scattering of visible and infrared radiation by aerosol particles and air molecules; spectral transparency of real atmosphere; albedo of earth s surface and clouds; direct solar radiation; scattered and reflected radiation; total radiation; thermal radiation of the atmosphere; and net radiation.

1968

46014 **APTIC NO. 66022**

Eliassen, Arnt

REMARKS ON RADIATION AND ATMOSPHERIC DYNAMICS. *World Meteorological Organization, Geneva (Switzerland) and International Union of Geodesy and Geophysics, Paris (France), Radiat. Incl. Satell. Tech., Proc. WMO/IUGG Symp., Bergen, Norway, 1968, WMO TN 104, 248, TP 136, p. 475-477. 9 refs. (Aug.)*

The effects of radiation on atmospheric dynamics are discussed. Vertical gradients of the heating rate change the static stability. A rising motion in the troposphere produced by a radiative heat source carries moisture from below. This normally results in increased radiative cooling which counteracts the original heat source. A rising current in the stratosphere reduces the local ozone concentration and brings about a reduced O_3 heating. A realistic model of the atmosphere should include this feedback mechanism. Heating rates should be computed from distributions of absorbers, cloud, and snow cover, which are allowed to vary with time as a result of the motions.

46015 **APTIC NO. 65998**

Kondratyev, K. Y., I. Y. Badinov, L. S. Ivlev, and G. A. Nikolsky

AEROSOL STRUCTURE OF THE TROPOSPHERE AND STRATOSPHERE. *World Meteorological Organization, Geneva (Switzerland) and International Union of Geodesy and Geophysics, Paris (France), Radiat. Incl. Satell. Tech., Proc. WMO/IUGG Symp., Bergen, Norway, 1968, WMO TN 104, 248, TP 136, p. 243-247. 9 refs. (Aug.)*

The distribution and structure of aerosols in the troposphere and stratosphere are discussed. The presence of solid aerosols of the Earth s and cosmic origin in the atmosphere is of great importance in air pollution. Investigations of the vertical distribution of atmospheric aerosol show: the most stable layers are below the tropopause and at the heights of 17-23 km; there is a relationship between aerosol and temperature profiles; aerosol layers are uniform and of large horizontal extension; optical densities of atmospheric aerosol in the upper troposphere and stratosphere can differ by nearly two orders of magnitude; the aerosol particle-size distribution varies substantially with height; and the major portion of aerosol in the upper troposphere and stratosphere is composed of hygroscopic particles.

1966

46016 **APTIC NO. 68534**

Gatz, Donald F.

DEPOSITION OF ATMOSPHERIC PARTICULATE MATTER BY CONVECTIVE STORMS: THE ROLE OF THE CONVECTIVE UPDRAFT AS AN INPUT MECHANISM. *Michigan Univ., Ann Arbor, Dept. of Meteorology and Oceanography, Atomic Energy Commission Contract AT (11-1)-1407, Office of Research Administration Proj. 06867, Scientific Rept. 1, 230p., March 1966. 74 refs.*

NTIS: COO-1407-6

The mechanisms by which airborne particulate matter enters convective storms was investigated. A field observation program was established near Chickasha, Okla. to obtain rain scavenging data of high resolution from convective storms. Sequential samples of rain were collected at frequent intervals and analyzed for artificial radioactivity, plant pollens, and gross residue. Observations were made of raindrop-size spectra, rainfall, wind, and concentrations of pollen in air. Conventional synoptic weather data were used to depict large scale flow conditions aloft and at the surface, and to prepare vertical cross sections of the atmosphere for the time of the storm.

Contaminants deposited in rain from most convective storms are drawn into the storms from low levels of the atmosphere, along with the water vapor. Temporal variations of contaminant concentration in rain at the ground are generated both within and below the cloud. The interacting mechanisms which cause these variations include evaporation, dilution, first precipitation of condensed water, and impaction. (Author abstract modified)

BASIC SCIENCE AND TECHNOLOGY

1974

46017 **APTIC NO. 68498**

Cha, C. Y. and B. J. McCoy

THERMAL FORCE ON AEROSOL PARTICLES. *Phys. Fluids, 17(7):1376-1380, July 1974. 21 refs.*

With a method previously applied to thermal transpiration and planar radiometric force, the force on a spherical aerosol particle in a gas which sustains a temperature gradient is analyzed theoretically. Expressions for thermal force and thermal velocity span all values of the particle Knudsen number and show the effect of imperfect accommodation. The model consists of a spherical particle suspended in a gas midway between two plane surfaces at different temperatures. The theory of thermophoresis (thermal force) is an adaptation of the analysis used for the planar thermal (radiometric force). The linearized Burnett second-order constitutive equations for heat flux and stress applied to the gas between the plane surfaces and provide the coupling between temperature gradients and momentum flux. Expressions for transition regime viscosity and thermal conductivity coefficients are used for the particular geometry of the problem. These transport coefficients allow the theory to span the transition regime. A differential equation for the gas temperature distribution is derived and solved with the aid of boundary and limit conditions. The temperature-induced stress provides a force on the spherical aerosol particle. When the thermal force is balanced by a drag force, an expression for the velocity of thermophoresis is obtained. The theoretical thermal force and thermophoretic velocity are compared with experimental data and with previous theories.

46018 **APTIC NO. 68486**

Ebitani, ATsushi, Hiroo Niiyama, and Etsuro Echigoya

THE ROLE OF HYDROGEN IN THE CATALYTIC REDUCTION OF NITROGEN MONOXIDE OVER IRON OXIDE. *(Sankatetsu shokubaijo deno issanka chisso no sesshoku kangen ni okeru suiso no yakuwari). Text in Japanese. Nippon Kagaku Kaishi (J. Chem. Soc. Japan), no. 7:1185-1188, 1974. 2 refs.*

The mechanism and kinetics of the reduction of nitric oxide with hydrogen over an iron oxide-alumina catalyst was investigated. Two possible roles of hydrogen were tentatively considered: direct interaction with NO to form a H2-NO surface complex (Langmuir-Hinshelwood mechanism) and a reducing action toward the oxidized surface to complete the catlystic sequence (redox mechanism). The rate of reaction of NO with the reduced surface in the absence or presence of H2 was compared using a pulse technique. The rate at the extreme initial stage was unaffected by the atmosphere (either helium or H2), and the catalyst under working conditions was in the oxidized state. The rate or reduction of the catalyst with H2 (3 times 10 to the minus 5 mol/min g) was almost the same as that of the catalytic reduction of NO (2 times 10 to the minus 5 mol/min g) obtained in a closed circulation system, suggesting that the reaction was of the redox type.

46019 **APTIC NO. 69158**

Echigoya, Etsuro, Hiroo Niiyama, and Atsushi Ebitani

REDUCTION OF NITRIC OXIDE WITH HYDROGEN OVER VARIOUS METAL OXIDE CATALYSTS. *(Kinzoku Sankabutsu Shokubai Jodeno Issanka Chisso to suiso no hanno). Text in Japanese. Nippon Kagaku Kaishi (J. Chem. Soc. Japan), no. 2:222-226, 1974. 6 refs.*

The reduction of nitric oxide with hydrogen over various metal oxide catalysts supported on gamma-alumina was investigated using a conventional flow microreactor at 420 C (atmospheric pressure). Platinum, palladium, copper, and nickel catalysts showed high selectivity for ammonia formation. Iron and chromium were selective for nitrogen formation, while cobalt and manganese were selective for nitrous oxide formation. All catalysts tested seemed to fall into one of these general groups based on product formation. Nitrous oxide appeared to be an intermediate compound for nitrogen formation from nitric oxide among those catalysts selective for the formation of either nitrogen or nitrous oxide formation. The reduction of nitric oxide over iron appeared to proceed through a redox pathway on the catalyst according to results obtained from kinetic studies.

46020 **APTIC NO. 68351**

Edwards, H. W. and R. J. Rosenvold

UPTAKE OF TETRAETHYL LEAD VAPOR BY ATMOSPHERIC DUST COMPONENTS. *Colorado State Univ., Fort Collins, National Science Foundation Grant GI-44423, Rept. MEP 74-75 HWE-RJR1, 5p., 1974 (?). 13 refs.*

Exposure of simulated atmospheric dust components to air streams doped with tetraethyl lead, both in the presence and absence of water vapor, resulted in lead uptake by the solids. On a specific surface area basis for identical lead exposures, graphitized carbon black took up the most lead, followed by carbon black, aluminum oxide, and silicon dioxide in decreasing order of sorption. The sorbed lead was only very slowly removed upon aging. A major effect of aging exposed samples was the conversion of a substantial portion of the sorbed lead compounds into species which were not removed with normal-hexane extraction or moderate heating, implying that sorption of organic lead compounds on atmospheric dust components may represent a significant scavenging mechanism and that atmospheric particulates may serve as substrates for conversion of sorbed organic lead to inorganic lead compounds. Estimations of the quantity of sorbed lead that might occur under atmospheric conditions showed that for a 30% monolayer coverage by sorbed TEL the quantity of sorbed TEL/cu m of air is approximately 0.3 micrograms, indicating that the potential contribution of lead sorbed on atmospheric dusts to the total lead burden cannot be ignored.

46021 **APTIC NO. 68685**

Gitchell, Alice, R. Simonaitis, and Julian Heicklen

THE INHIBITION OF PHOTOCHEMICAL SMOG. II. INHIBITION BY HEXAFLUOROBENZENE, NITROBENZENE, NAPHTHALENE, AND 2,6-DI-TERT- BUTYL-4-METHYLPHENOL. *J. Air Pollution Control Assoc., 24(8):772- 775, Aug. 1974. 8 refs.*

Additional inhibitors for the conversion of nitric oxide to nitrogen dioxide in propylene-NO-oxygen irradiated mixtures were tested at 25 C. These mixtures initially contained 16 m Torr C3H6, 8 m Torr NO, 0.012 m Torr NO2, additive, and enough O2 to bring the total pressure to 100 torr. The NO2 pressure was monitored photometrically. In the absence of additive, the NO2 pressure first increased with irradiation time, reaching a maximum conversion at about 15 min. As the irradiation time increased beyond 15 min, the NO2 pressure dropped. Before adding the inhibitors, runs were done with 10 torr of carbon monoxide added, and in these runs the conversion was speeded so that the maximum in NO2 pressure occurred at 10 min. This enhancement in conversion rate was considered to be diagnostic for the presence of hydroxyl radicals. Tenominute irradiations were conducted with various amounts of hexafluorobenzene (C6F6), nitrobenzene (C6H5NO2), or naphthalene (C10H8) added. The NO2 pressure was reduced to 1/2 its value in the absence of inhibitor with 270 m torr C6F6, 220 m torr C6H5NO2, or 4 m torr C10H8. The C10H8 did not reduce the NO2 pressure to zero. Studies of the percent conversion of NO to NO2 versus irradiation time were done with either 4.2 m torr C10H8 or 40 m torr 2,6-di-tert-butyl-4- methylphenol added. In the former case the peak conversion was delayed from 15 to 22 min, while in the latter case no delay occurred. However, with the 2,6-di-tert-butyl-4-methylphenol added, there appeared to be some reduction in the maximum value of percent conversion. (Author abstract)

46022 **APTIC NO. 68733**

Haas, L. A., C. F. Anderson, and S. E. Khalafalla

DECOMPOSITION OF NITRIC OXIDE IN A SILENT DISCHARGE. *Preprint, American Chemical Society, Washington, D. C., 19p., 1974. 23 refs. (Presented at the American Chemical Society, Division of Industrial and Engineering Chemistry, Annual Meeting, Atlantic City, N. J., Sept. 8-13, 1974.)*

The effect of some physical and chemical parameters on nitric oxide decomposition was determined at 25 C in a laboratory silent discharge reactor on a gas containing 1% NO in helium in order to investigate the nonthermal conversion of NO to less toxic products. Nitric oxide decomposition increased with increasing applied voltages in the range of 9-25 kV, using a 3 mm electrode-gap reactor. The threshold value was estimated at about 3.3 kV. Over 98% of the NO was principally decomposed to its elements with gas residence times greater than 1.2 minutes at an applied voltage of 24 kV. Neither the nitrogen nor oxygen formation yields were equivalent at shorter residence times, with the O2 being persistently lower than the N2. The disparity between N2 and O2 formation and NO decomposition became progressively less as the residence time increased. The formation of an intermediate dinitrogen trioxide could account for the observed results. The addition of water, carbon dioxide, and carbon monoxide decreased the NO removal. Addition of CO to NO or nitrous oxide resulted in CO2 formation, indicating that both nitrogen oxides were reduced. (Author abstract modified)

46023 **APTIC NO. 66170**

Hamada, Y. and A. J. Merer

ROTATIONAL STRUCTURE AT THE LONG WAVELENGTH END OF THE 2900 A SYSTEM OF SO2. *Can. J. Phys., 52(12):1443-1457, Aug. 1974. 20 refs.*

Rotational analyses were carried out for the three longest wavelength bands observable in the 2900 A system of sulfur dioxide (at 3340, 3359, and 3395 A). Although the bands are perturbed quite severely, it was possible to prove that they are type C bands, and that the approximate upper state geometric structure of the molecule is r(S-O) equals 1.53 A, angle OSO equals 99 deg. Comparison with theoretical calculations leaves little doubt that the upper electronic state is the pi yields pi asterisk 1A2 state, appearing in absorption by Herzberg-Teller mixing through Q3 prime(b2). A vibrational numbering for these bands is given, which is consistent with the inertial defect obtained from the rotational analysis, and with recent isotope data; the 3395 band appears to be 031-000, and the electronic origin falls near 27,930/cm. (Author abstract)

46024 **APTIC NO. 68645**

Harms, L.

EXPERIMENTAL INVESTIGATION OF THE FLOW FIELD OF A HOT TURBULENT JET WITH LATERAL FLOW. PART II. *(Experimentelle Untersuchungen ueber das Stroemungsfeld eines heissen, turbulenten Strahles bei Queranstroemung, Teil II). Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt E.V. ZNW, Goettingen (West Germany), Rept. 1-B 157-73 A 21, 50p., Sept. 28, 1973. 18 refs. Translated from German. National Aeronautics and Space Administration Contract NASw-2483, NASA TTF-15,706 Scientific Translation Service, 45p., June 1974.*

The flow field of a hot round jet in a crosswind was investigated in a 3-meter wind tunnel using a nine-hole probe. The investigations were designed to produce information on the mixing processes of the jet and the cross flow, including the influence of temperature. For this purpose, the flow and temperature field of a heated round turbulent nozzle jet over several cross- sections, at distances up to 30 nozzle diameters, were measured. Knowledge of the variation and mixing of the jet in a cross flow is important in studies of the design of jet engines, the performance and stability of the aircraft, the propagation of smoke fumes from chimneys into the atmosphere, and the mixing of warm cooling water flow in rivers.

46025 **APTIC NO. 68593**

Haynes, B. S. and N. Y. Kirov

NITRIC OXIDE FORMATION DURING THE COMBUSTION OF COAL. *Combustion Flame, 23(2):277-278, Oct. 1974. 7 refs.*

The role of fuel-nitrogen in the formation of nitric oxide during coal combustion is very little understood, although it is apparent that a significant proportion of the total nitric oxide emissions derives from the combined nitrogen, especially at lower temperatures, as is the case with gaseous and liquid fuels containing fuel-nitrogen. The results of a study of NO emissions during the ignition and burnout stages in the underfeed firing of a bituminous coal in a pot furnace are presented. The NO emission shows two distinct stages: initially, a high concentration which remains steady for a period before falling rapidly to a new level about 90 ppm. The transition between the two stages corresponds precisely to the disappearance of the last traces of raw coal and to a fairly uniform bed temperature of about 800 C, i.e., to the transition between ignition and burnout stages. The results obtained for higher and lower air rates were similar with regard to this close correspondence between NO emissions and the two stages of combustion. The high levels of NO during the relatively low temperature, fuel- rich ignition zone are inconsistent with a mechanism involving the fixation of atmospheric nitrogen, and it would appear that such emissions are due to the oxidation of nitrogenous volatiles evolved during the ignition period. The NO formed during burnout is greatly dependent on the burning rate, with higher rates given higher temperatures and more NO. It is likely that in this region, the NO is thermally generated. Although the contribution of thermal NO to total emission will depend on the residence time of the gases in the hot-zone, the ignition stage NO, probably derived from nitrogen in the fuel, constitutes a large fraction of this emission and possible control strategies should take this into account.

46026 **APTIC NO. 68647**

Helmy, Ehsan M. and S. B. Woo

THE PHOTODETACHMENT CROSS-SECTION AND THRESHOLD ENERGY OF NEGATIVE IONS IN CARBON DIOXIDE (PROGRESS REPORT). *Delaware State College, Dover, Dept. of Physics and Astronomy and Delaware Univ., Newark, Physics Dept., National Aeronautics and Space Administration Grant NGR 08-002-005, 19p., March 1974. 6 refs.*

NTIS: N74-19777

A drift tube with a cold cathode discharge ion source was used to study the photodetachment cross-section and threshold energy of negative ions in carbon dioxide. Pure carbon trioxide anion was obtained in the photodetachment region of the drift tube at pressures greater than 1 torr and at potential to pressure ratios of less than 12 volt/cm/torr. The CO3 anion plus carbon dioxide was produced in the drift tube by the reaction of oxygen anion with 2 moles of CO2. The electron affinity of CO3 anion was larger than 2.7 electron volts. The sunlight photodetachment rate for CO3 anion appears on the basis of present findings to be much smaller than that previously reported. The probability of having the photodetached electrons reattach to form negative ions was verified to be less than 1%. The construction of a mass identified drift tube and plans for photodetachment of carbon tetroxide anion are currently in progress.

46027 **APTIC NO. 68311**

Jacobs, P. A.

A RANDOM MEASURE MODEL FOR THE EMISSION OF POLLUTANTS BY VEHICLES ON A HIGHWAY. *Stochastic Processes Appl., no. 2:163-176, 1974. 8 refs.*

A random measure model for the emission of pollutants by vehicles on a highway is described. Consider a collection of vehicles on a highway, with the velocity process of the kth vehicle being a Markov process with continuous paths independent of the velocity processes of the other vehicles but with the same probability law. The discharge of pollutants by the kth vehicle is described by a nondecreasing right continuous process who probability law depends on the path of the vehicle in such a way that the discharge process has independent increments given the velocity process of the vehicle. The limiting behavior of the total amount of pollutants discharged in an interval of the highway by time t by all the vehicles is studied as time t approaches infinity. (Author abstract modified)

46028 **APTIC NO. 69071**

Jeffries, Harvey, Donald Fox, Richard Kamens, and Lyman Ripperton

PHOTOCHEMICAL REACTIONS IN A DUAL OUTDOOR SMOG CHAMBER. *Am. Chem. Soc., Div. Environ. Chem., Prepr., 14(1):295-297, 1974. (Presented at the American Chemical Society, Division of Environmental Chemistry, National Meeting, 167th, Los Angeles, Calif., April 1-5, 1974, Paper 55.)*

The development and applications of a dual outdoor smog chamber are described. The facility was designed to investigate the chemical behavior of urban atmospheric pollution systems projected for 1975-1985. The dual nature of the chamber permits the direct assessment of different initial concentrations in a given photochemical system regardless of temperature and solar radiation changes. During a 4-month time period over 40 12-hour runs were made under various physical and chemical conditions. The reactant profiles of a run with propylene as the non-methane hydrocarbon and nitric oxide and nitrogen dioxide are illustrated. The effect of hydrocarbon concentration on the rate of conversion of NO to NO2, the subsequent generation of ozone, and the effect of the solar radiation profile and the temperature profile on these processes were assessed.

46029 **APTIC NO. 68663**

Kim, Byong H. and Heishichi Ishikawa

CHANGES IN PROPERTIES OF SYNTHETIC DAWSONITE BY THERMAL TREATMENT. *(Gosei dosonaito no kanetsu shori ni yoru seijo no henka). Text in Japanese. Nippon Kagaku Kaishi (J. Chem. Soc. Japan), no. 8:1417-1420, Aug. 1974. 12 refs.*

The effects of thermal treatment on properties of synthetic dawsonite were investigated by differential thermal analysis and thermogravimetric curves, X-ray diffraction, infrared absorption, and measurements of specific gravity, porosity, specific surface area, and sulfur dioxide adsorption. Carbon dioxide was slowly evolved from the synthetic dawsonite, with collapse of the crystal structure. Heating to 360 C caused complete CO2 dispersal, with the production of sodium aluminate gel. Carbon dioxide and water of crystallization in the synthetic dawsonite were evolved at 650 C to form NaAlO2 which was very hygroscopic. The beta form of sodium aluminate existed below 800 C, while gamma form was present above 800 C. Although synthetic dawsonite was hardly hydrolyzed, its hydrolysis was promoted by increasing the temperature. The hydrolysis of calcination products gave sodium aluminate solution and pseudoboehmite or bayerite. The adsorption of SO2 increased with an increase of CO2 removal up to 400 C, with the chemical adsorption becoming prevalent on the calcination products above a temperature of 300 C.

46030 **APTIC NO. 69078**

Kudo, Tetsuichi, Toshikatsu Manabe, Tetsuo Gejo, Michiharu Seki, and Kazuetsu Yoshida

NEW OXIDE CATALYSTS WITH PEROVSKITE-RELATED STRUCTURE FOR REDUCTION OF NITROGEN OXIDE WITH AMMONIA. *Am. Chem. Soc., Div. Environ. Chem., Prepr., 14(1):362-366, 1974. 6 refs. (Presented at the American Chemical Society, Division of Environmental Chemistry, National Meeting, 167th, Los Angeles, Calif., April 1-5, 1974, Paper 68.)*

New oxide catalysts with perovskite related structure were investigated for the electrochemical reduction of nitric oxide with ammonia. Zirconium promoted lanthanum copper oxide with two dimensional analogue of the perovskite structure showed better characteristics than lanthanum cobalt oxide. The reaction kinetics are apparently first order with respect to the NO concentration. The conversion of NO exceeds 90% if the contact time is longer than 0.17 sec. Concentrations of both nitrous oxide and nitrogen dioxide in the outlet gas were less than the detection limits of infrared (for N2O) and ultraviolet (for NO2) analyzers. There was no decrease in catalytic activity during a continuous test for 2000 hr at 350 C using a synthetic gas containing: 700 ppm nitric oxide, 1000 ppm sulfur dioxide, 1% oxygen, 12% carbon dioxide, 12% water, balance nitrogen, and 550 ppm ammonia. Reaction mechanicams are proposed.

46031 **APTIC NO. 68252**

May, Hans, Helmut Ehrhardt, and Werner Mueller

NEW SPECTROSCOPIC INVESTIGATIONS OF THE REACTION PROCESSES IN OTTO-ENGINES. *Ministry of the Interior (West Germany) and Ministry for Research and Technology (West Germany), Low Pollut. Power Syst. Dev., 2nd Symp. Comm. Challenges Mod. Soc./2nd Statussemin. Veh. Traffic Technol., Duesseldorf, Germany, 1974, p. A 2.3.1-A 2.3.12. 12 refs. (Nov. 4-8, Paper A 2.3.)*

An emission-absorption spectroscopic method for measuring combustion temperatures in the cylinder of an internal combustion engine is described. During the power stroke of a single-cylinder test engine, pressure and spectral radiation density at the band head of the hydroxy radical (3064 A) and at the sodium-line (5891 A) are measured. The course of temperature in the cylinder is calculated from the measured variables. The OH radicals exist only in the combustion zone; thus, the spectroscopic measurements are not affected by the temperature of the unburned mixture and give information only about the temperature of the burning zone. Such information is useful in classifying the reaction mechanism during the combustion and expansion process, particularly with regard to nitric oxide formation.

46032 **APTIC NO. 68817**

Penzhorn, R. D. and W. Schoeck

AEROSOL FORMATION BY LIGHT-INDUCED REACTIONS OF AIR POLLUTANTS. *(Aerosolbildung durch lichtinduzierte Reaktionen atmosphaerischer Schadstoffe in Luft). Text in German. Preprint, 17p., 1974 (?). 18 refs.*

Photochemical aerosol formation was studied in the air-sulfur dioxide, SO2-nitric oxide-air, NO-cis-butene-air, and SO2-NO-cis-butene-air systems at different partial pressures of the reaction partners. Sunlight or lightbulbs were used as light sources. In SO2-air systems, the addition of NO resulted in an increase in the rate of particle formation and in the particle concentration by about one order of magnitude. While there was no particle formation in the NO-cis-butene-air system, the addition of SO2 caused intense particle formation. Rather slow, gradual reduction in the particle concentration was observed after cessation of the irradiation, followed by recombination of the particles upon renewed exposure. The condensation and particle growth processes occurring at reduced light intensity were clearly distinguishable from separation processes. A stationary state with constant particle concentration and particle size distribution established itself after a certain irradiation time. These parameters were primarily determined by the relative composition of the initial substances rather than by their absolute partial pressure. Sulfuric acid was identified as the principal component of the photochemical smog, but photooxidation products of cis-butene, such as acetic acid, acetaldehyde, and acetoin were also detected in the aerosol.

46033 **APTIC NO. 68980**

Saito, Heizo, Yo Matsuo, Motoyasu Kamada, Yuzo Sakamoto, and Osamu Nakano

FUNDAMENTAL STUDIES ON POLLUTANT DIFFUSION NEAR BUILDINGS (6). STUDIES ON CAVITIES IN PLATE MODELS. *(Tatemono kinbo ni okeru osenbutsu kakusan ni kansuru kiso kenkyu (sono 6). PLATE mokei ni okeru CAVITY ni kansuru jikken). Text in Japanese. Preprint, Japan Society of Architecture, Tokyo, p. 183-184, 1974. 6 refs. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4092.)*

Plate models were used to study cavities in a wind tunnel whose floor was studded with two-dimensional rough spots to vary air currents. Wind speed profiles and relationships between the height of the rough spots and the roughness parameter were examined. Two-dimensional and three-dimensional square plates were placed perpendicular to air flow in the wind tunnel. Relationships were examined between the cavity and the nature of wind tunnel air flow, as well as the plate shape. Linear relationships were found between the length of the cavity and the Reynolds number for turbulent flow, as well as the square root of the forward surface area of the plate.

46034 **APTIC NO. 68983**

Saito, Heizo and Makoto Tsujimoto

SOME INFORMATION ON SMOKE EXPULSION. *(Haien ni kansuru 2, 3 no chiken). Text in Japanese. Preprint, Japan Society of Architecture, Tokyo, p. 211-212, 1974. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4106.)*

Smoke propagation studies were conducted under controlled conditions in a tunnel-type hall (width, 3.3 m; height, 1.65 m; distance from smoke and heat source to smoke outlet, 20 m). The characteristics of smoke expulsion through a ceiling slit (5 cm by 3.1 m) running the width of the hall were compared to those when the ceiling opening was a square (40 cm by 38.7 cm). The slit was superior to the square opening in eliminating smoke. When the end of the hall was open, smoke expulsion was complete, but when the hall was partially enclosed or wholly enclosed by a partition lowered from the ceiling, smoke started to settle toward the floor. Equations for smoke flow were determined.

46035 **APTIC NO. 68694**

Shiio, Hajime

THE DEODORIZATION MECHANISM OF HYDROGEN SULFIDE BY ACTIVATED CARBON. *(Kasseitan ni yoru ryuka suiso no dasshu kiko). Text in Japanese. Akushu no Kenkyu (Odor Research J. Japan), 41(16):31-35, Aug. 1974. 4 refs.*

Hydrogen sulfide is adsorbed by activated carbon and forms sulfur according to the following mechanism: adsorption of H2S on the surface of activated carbon; and formation of S and water by the chemical reaction of H2S and excited oxygen atoms on the surface. Activated carbons, following different chemical treatments, were used to study the adsorption mechanism. One gram of the activated carbon was placed in a U-shaped glass reactor which was immersed in a 32 C constant temperature bath. A mixture of H2S and compressed air was introduced into the reactor at a rate of 300 ml/min for 30 min. The weight increase of the activated carbon due to the adsorbed H2S and S was determined. Nitrogen gas was then introduced for 30 min at 60 C and the weight decrease due to the removal of H2S was measured. At H2S/air of unit, chemical treatment did not show any effect on the H2S adsorption but activated carbon containing amino groups or that treated with sodium nitrite promoted the formation of sulfur. At zero air concentration, activated carbons from different chemical treatment did not show a noticeable difference in the H2S adsorption and S formation.

46036 **APTIC NO. 69021**

Shipilov, O. I.

THE INVESTIGATION OF THE TURBULENT GAS JET WITHOUT USING THE FREE CONVECTION THEORY APPROXIMATIONS. *(Issledovaniye vertikal noy turbulentnoy strui gaza bez ispol zovaniya priblizheniy teorii svobodnoy konvektsii). Text in Russian. Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana, 10(5):467-474, May 1974. 10 refs.*

The influence of the thermal and kinetic energies as well as of the compressibility of the air on the boundary layer equations for high-energy, high-temperature vertical turbulent axisymmetrical jets was investigated with view to eliminate the inaccuracy involved in Bussinesque s approximation method. The equation for the boundary layer of vertical turbulent jets was obtained by introducing the kinetic coefficient of turbulent viscosity and of Prandtl s number. Actual calculations concerning the effect of compressibility and the kinetic energy for a dimensionless flow of excess enthalpy revealed rapid initial increase in the excess enthalpy almost to the magnitude of the total excess enthalpy, and subsequent slow decrease, which is indicative of the mutual conversions of the kinetic and thermal energies of the turbulent flow into each other. The slow decrease in the enthalpy flow after peaking is due to the partial dissipation of the kinetic energy into thermal energy. The influence of the kinetic energy and compressibility was significant in the case of jets from high-speed and high- temperature sources as well as of jets of large vertical length, as in the case of flue gas stacks and in dust separation by means of jet engines in quarries.

46037 **APTIC NO. 68701**

Stewart, R. F., A. W. Hall, J. W. Martin, W. L. Farrior, and A. M. Poston

NUCLEAR METER FOR MONITORING THE SULFUR CONTENT OF COAL STREAMS. *Bureau of Mines Technical Progress Rept. 74, 13p., Jan. 1974. 9 refs.*

A nuclear meter based on measurement of prompt capture gamma rays is being developed for monitoring the sulfur content of coal streams. Equipment has been built to measure sulfur rapidly, and methods have been devised to compensate for changes in moisture, ash, and bulk density of coal flowing through a bin. Pilot plant tests of the system with various additives to different coals show a precision and accuracy of 0.02% sulfur and 0.04% sulfur, respectively. A hard-wired meter has been fabricated for testing in a commercial coal preparation plant based on these results. (Author abstract modified)

46038 **APTIC NO. 68661**

Sugioka, Masatoshi and Kazuo Aomura

STUDIES OF THE CRACKING REACTIVITY OF ORGANIC SULFUR COMPOUNDS (PART 2). CATALYTIC CRACKING REACTIVITY OF ALIPHATIC MERCAPTANS AND SULFIDES ON SOLID ACID CATALYST. *(Yuki io kagobutsu no bunkai hannosei ni kansuru kenkyu (sono 2)). Text in Japanese. Hokkaido Daigaku Kogakubu Kenkyu Hokoku (Bull. Fac. Eng., Hokkaido Univ.), no. 71:195-206, June 1974. 16 refs.*

The catalytic cracking reactivity of various aliphatic mercaptans and sulfides on silica-alumina catalysts was investigated with a pulse reactor. The orders of cracking reactivity for aliphatic mercaptans from least to greatest reactivity, was as follows: ethyl mercaptan, normal-propyl mercaptan, normal-butyl mercaptan, iso-propyl mercaptan, and secondary-butyl mercaptan. The reactivity order for aliphatic sulfides, from least to greatest reactivity was: dimethyl sulfide, diethyl sulfide, normal-dipropyl sulfide, and normal-dibutyl sulfide. The orders of reactivity were parallel to the order of the alkyl carbonium ion stability, and linear relationships were observed between the logarithms of the apparent first order rate constants of aliphatic mercaptans and sulfides and the enthalpy change in the reaction of the hydride abstraction from the corresponding paraffins. The cracking reactivity of aliphatic mercaptans and sulfides in silica-alumina catalysts appeared to depend on the stability of the carbonium ion which was produced from mercaptan and sulfide molecules.

46039 **APTIC NO. 68436**

Sugiyama, Sachio and Masanobu Hasatani

FUNDAMENTAL INVESTIGATIONS ON THE CONTROL OF NITROGEN OXIDE EMISSIONS FROM COMBUSTION PROCESSES. *(Chisso sankabutsu hassei yokushi no kiso kenkyu). Text in Japanese. Kagaku Kogyo (Chem. Ind.), 25(11):1280-1288, Nov. 1974. 22 refs.*

Fundamental studies in the field of nitrogen oxides--their emission, control, and methods of formation--are reviewed. Equations, tables, graphs, and diagrams are included.

46040 **APTIC NO. 68524**

Suzuki, Tadao, Nobuo Igarashi, Tohoru Imai, Yasuo Sueyoshi, Masanori Matsuno, and Yoshio Komaki

AN EXPRIMENT ON PHOTOCHEMICAL REACTION CONDUCTED BY MOBILE SMOG CHAMBER WAGON. *(Idoshiki sumoggu chenba sha ni yoru kokagaku hanno ni kansuru kenkyu). Text in Japanese. Nippon Jidosha Kenkyujo Kenkyu Sokuho (Res. Lett. Japan Automob. Inst.), no. 19:1-35, March 1974. 10 refs.*

Two mobile smog chambers using artificial ultraviolet radiation were used to investigate photochemical reactions in Kawasaki (Kanagawa Prefecture), a heavy industrial district, and in a residential area of Tokyo. The same photochemical reaction patterns for oxidants, nitric oxide, and nitrogen dioxide appeared as those reported for Los Angeles. Initial nitrogen oxide concentrations correlated with final oxidant values, though no significant relation appeared between initial hydrocarbon values and final oxidant values. The final oxidant value was apt to approximate 0.1 ppm when the ratio of initial total hydrocarbons to NOx was set relatively large; however, when the ratio was small, the final oxidant concentrations tended to be high. Concentrations of each hydrocarbon component tended to show a general decrease, while formaldehyde was apt to increase rapidly after one hour of ultraviolet irradiation. Slight odors and eye irritation occurred in some cases.

46041 **APTIC NO. 69982**

Terai, Toshio and Katsuyuki Nitta

ON SMOKE AND AIR MIXTURES. *(Kemuri to kuki no kongo keitai ni tsuite). Text in Japanese. Preprint, Japan Society of Architecture, Tokyo, p. 209-210, 1974. 7 refs. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, Paper 4105.)*

The flow characteristics of smoke and air mixtures were investigated by drawing smoke through a duct through an attached grating to induce turbulent flow. Three different flow patterns were observed. Patterns 1 and 2 were similar, and a homogenous mixture ultimately filled the duct, but Pattern 1 produced cirro-cumulus cloud type formation, whereas Pattern 2 showed turbulent flow eddies. In Pattern 3, smoke settled down by following the sidewalls of the duct, and showed a tunnel pattern.

46042 **APTIC NO. 68375**

White, William F.

MICROWAVE SPECTRA OF SOME SULFUR AND NITROGEN COMPOUNDS. *National Aeronautics and Space Administration, Hampton, Va., Langley Research Center, NASA-TN-D-7450, Work Unit 160-44-64-03, Rept. L-9255, 105p., May 1974.*

NTIS: NASA-TN-D-7450, N74-21777

Microwave absorption spectra suitable for chemical analysis were measured and tabulated. Most of the measurements were made by a computer-controlled, Stark modulated spectrometer in the frequency range 26,500 to 40,000 MHz, with a few spectra in the range of 18,000 to 26,500 MHz. Measurements of absorption frequency, peak intensity, and integrated intensity are described along with experimental conditions, such as Stark field intensity, sample temperature and pressure, and microwave power level. The apparatus and procedures used are described. Tables of spectral data are given for the following compounds: acetonitrile, ammonia, 3-butenenitrile, carbonyl sulfide, dimethyl disulfide, ethanamine, ethanethiol, ethylene glycol cyclic sulfite, hydrocyanic acid, isoxazole, methanamine, methanethiol, methyl sulfide, methyl thiirane, nitroethane, nitromethane, propanenitrile, 2-propenenitrile, 2-propene-1-thiol, pyridine, pyrrole, sulfur dioxide, tetrahydrothiophene, thiazole, thietane, thiirane, and thiophene. (Author summary)

46043 **APTIC NO. 68756**

Yan, Johnson F.

TIME DEPENDENCE OF DISTRIBUTION FUNCTIONS. I. LOG-NORMAL DISTRIBUTION FUNCTION AND KINETICS OF PARTICLE SIZE REDUCTION. *Preprint, American Chemical Society, Washington, D. C., 10p., 1974. 8 refs. (Presented at the American Chemical Society, Division of Environmental Chemistry, National Meeting, 168th, Atlantic City, N. J., Sept. 8-13, 1974.)*

A model is proposed for random processes of particle size reduction such that the kinetics of particle size reduction can be followed by investigating the time dependence of average size. Assuming that a log-normal distribution function is applicable, the geometric standard deviation is a measure of the instantaneous rate constant of size reduction. The overall kinetics may be obtained by plotting the average particle size times the geometric standard deviation against the average particle size. The application of the model requires that the size growth or reduction be random and that the size distribution be log-normal throughout the process. These two conditions can generally be met with most kinetic processes involving size growth. Examples of the model illustrating its application are provided for length distribution studies of mechanical pulp fibers and for studies of diffusion-controlled precipitation process. (Author abstract modified)

46044 **APTIC NO. 69811**

Japan Instrumentation Control Assoc., Pollution Measurement Equipment and Standard Research Committee

SAFETY AND HAZARD PREVENTION MEASURES IN HANDLING HIGH PRESSURE GASES FOR AIR POLLUTANT MEASUREMENT. *(Taiki osen keisoku ni okeru koatsu gasu no toriatsukai ni kansuru anzen bosai ni tsuite). Text in Japanese. Keiryo Kanri Keisoku Keiso (J. Instrum. Control Assoc. Japan), 23(9):427-433, Sept. 1974. 5 refs.*

Precautions and regulations are discussed for handling high pressure gases involved in taking pollution measurements. High pressure gases are separated into two categories: compressed and liquefied. According to their characteristics, high pressure gases can be classified as inflammable, supporting combustion, poisonous, and inert. Care must be exercised also in the handling of inert gases, since an excess of inert gas can cause oxygen lack in the environment. The guidelines for use of high pressure gases, published by the Japan Environmental Bureau in October 1973, are outlined. General rules for handling high pressure gases are listed. The characteristics of the following gases are described: oxygen, acetylene, hydrogen, nitrogen, ammonia, chlorine, carbon monoxide, sulfur dioxide, hydrogen sulfide, carbon dioxide, methane.

1973

46045 **APTIC NO. 68742**

Bowman, B. R., D. T. Pratt, and C. T. Crowe

EFFECTS OF TURBULENT MIXING AND CHEMICAL KINETICS ON NITRIC OXIDE PRODUCTION IN A JET-STIRRED REACTOR. *Symp. Int. Combust. Proc., 1972, p. 819-830, 1973. 25 refs.*

A conical jet-stirred reactor was used to study the formation of nitric oxide under near-stoichiometric conditions and at pressures varying from 0.25-1 atm in order to investigate the relative effects of turbulent mixing and chemical kinetics in high-intensity steady-flow combustion from both an experimental and anlaytical viewpoint. Measurements of temperature, mass-flow rate, equivalence ratio, and nitric oxide and oxygen concentrations were made and compared with perfectly stirred reactor (PSR) predictions based on kinetic rate data and mechanisms chosen to maximize predicted NO formation and to correctly predict reactor blowout conditions. Observed blowout flow rates were greater than twice those predicted using PSR assumptions and rate data and mechanisms from other investigators. Measured NO levels were three to ten times higher than those predicted by the PSR computer model. A one-parameter, two environment mixing model was unsuccessfully applied to the analytical model in an attempt to correct for imperfect stirring. Since factors controlling NO formation by the Zeldovich mechanism were suppressed (short residence time and low combustion temperature), the high levels of NO observed were postulated to be due to fat NO-producing reactions occurring during pyrolysis steps of the reaction mechanism. (Author abstract modified)

46046 **APTIC NO. 68343**

Broida, H. P.

HOW BASIC RESEARCH MIGHT CONTRIBUTE TO THE ALLEVIATION OF AIR POLLUTION. *In: Environmental Problems and Their International Implications. Colorado Associated University Press, 1973, p. 1-9. 20 refs.*

The role of basic research in the alleviation of air pollution is examined, and examples illustrating that role are provided by the author citing his personal experiences as a physics teacher and molecular physics researcher. Substantial contributions to air pollution research can be made by bringing the traditions and methods of the hard sciences to the study of air pollution, designing and improving measurement devices for applications to specific problems, and developing experimentally based models on which to base predictions, evaluations, and judgments. Laboratory research is cited governing the production of small metallic particles (about 5 nm in diameter) in a flowing inert gas stream for light scattering studies. Light scattering studies are also being performed on particles of 30-100 nm at the Santa Barbara laboratories of the University of California. Improved instrumentation for the detection of nitric oxide using ultraviolet absorption is also discussed in terms of ongoing laboratory investigations at Santa Barbara.

46047 **APTIC NO. 69166**

Burke, T. P. and J. A. Scott

THE PRODUCTION OF CONDENSATION NUCLEI BY ALPHA RADIATION. *Proc. Roy. Irish Acad., Sect. A, 73(11):151-158, 1973. 13 refs.*

Previous studies showed that condensation nuclei can be generated when air is irradiated by alpha-particles. This was confirmed and it was determined that a certain ionization intensity is required before nucleus production can be detected. The nucleus concentration at times varied erratically. This did not appear to be due primarily to the presence of trace gases. A direct relationship could not be established between the production rate and the humidity of the sample. Organic vapors had a marked effect on the nucleus concentration; depending on the concentration of the vapor in the sample, the formation of the nuclei could be completely inhibited. Further study will be necessary to establish the mechanism of the formation of the nuclei. (Author abstract modified)

46048 **APTIC NO. 68533**

D Alessio, A., A. Di Lorenzo, F. Beretta, and C. Venitozzi

OPTICAL AND CHEMICAL INVESTIGATIONS ON FUEL-RICH METHANE-OXYGEN PREMIXED FLAMES AT ATMOSPHERIC PRESSURE. *Combustion Inst., Pittsburgh, Pa., Proc. Int. Symp. Combust., 14th, University Park, Pa., 1972, p. 941-953, 1973. 29 refs. (Aug. 20-25.)*

Optical and chemical diagnostic techniques are used in the study of flat premixed flames at atmospheric pressure. An experimental apparatus was built to measure the angular and spectral characteristics of the light scattered by soot-forming flames and soot monochromatic extinction. The experimental results showed that the soot particles agglomerate in flames and that, optically, the aggregates behave in agreement with the Lorentz-Mie theory as spherical particles of 1250 A diameter. Chemical sampling on the collected soot, using gas chromatography, indicated the presence of polycyclic aromatic hydrocarbons. If the K lambda equals K lambda (-rho lambda) expression is used for the extinction coefficient, the dispersion exponent rho lambda depends only on the dimensions of the soot particles in the burned gas region; in the soot-forming region near the reaction zone, it depends also on the atomic hydrogen/carbon ratio, since the relative contribution of the polycyclic compounds to the absorption is still important. (Author abstract)

46049 **APTIC NO. 69130**

Davis, Douglas D., John T. Herron, and Robert E. Huie

ABSOLUTE RATE CONSTANTS FOR THE REACTION O(3P) PLUS NO2 EQUALS NO PLUS O2 OVER THE TEMPERATURE RANGE 230-339 K. *J. Chem. Phys., 58(2):530-535, Jan. 15, 1973. 23 refs.*

Absolute rate constants were measured for the reaction of atomic oxygen in its ground electronic state with nitrogen dioxide to give nitric oxide and oxygen using the technique of flash photolysis-resonance fluorescence. The rate constant for the reaction, as measured over the temperature range of 230-339 K, was 9.12 plus or minus 0.46 times 10 to the minus 12 cu cm/molecule sec and was independent of temperature. The value was within the standard error of the Arrhenius expression over the entire temperature range. The kinetic data reported at 298 and 339 K were measured using a glass reaction cell since NO2 decomposition occurred when a brass cell was used at these temperatures. The rate constant at stratospheric temperatures was estimated to be about a factor of two faster than indicated from previous measurements, with the amount of nitrogen oxide necessary to explain experimentally observed stratospheric ozone profiles being perhaps as much as a factor of four lower than previous estimates.

46050 **APTIC NO. 68744**

Hampson, R. F., W. Braun, R. L. Brown, D. Garvin, T. J. Herron, R. E. Huie, M. J. Kurylo, A. H. Laufer, J. D. McKinley, H. Okabe, M. D. Scheer, W. Tsang, and D. H. Stedman

SURVEY OF PHOTOCHEMICAL AND RATE DATA FOR TWENTY-EIGHT REACTIONS OF INTEREST IN ATMOSPHERIC CHEMISTRY. *J. Phys. Chem. Ref. Data, 2(2):267-311, 1973. 252 refs.*

Photochemical and rate data are evaluated for 28 gas phase reactions of interest for the chemistry of the stratosphere. Data sheets are provided for the following types of reactions: hydrogen radicals with nitrous acid, nitric acid, HNO, hydrogen peroxide, nitrogen dioxide, and ozone; hydroxyl radicals with nitric acid, nitrous acid, HNO, and ozone; irradiations of nitric acid, hydrogen peroxide, and ozone (visible and ultraviolet); the reaction of water with itself to form hydrogen peroxide; the production if nitrous acid from water plus nitric oxide plus nitrogen dioxide; reactions of water with nitric anhydride and with atomic oxygen; reactions of nitric oxide with hydrogen peroxide and with ozone; the formation of nitrogen trioxide from nitrogen dioxide and ozone; the reaction of nitrous oxide with oxygen; reaction between atomic oxygen and ozone to form molecular oxygen; and collisional quenching of oxygen. Preferred values for the rate constant or primary quantum yields and optical absorption coefficients are given where possible.

46051 **APTIC NO. 68447**

Hirano, Hideo, Shigeki Kobayashi, Kiyofumi Ishikawa, and Jin Tanaka

ON ACTIONS OBSERVED IN INGESTION OF CARBON MONOXIDE BY MICROORGANISM IN SOILS. *(Dojo biseibutsu no CO sesshu sayo ni tsuite). Text in Japanese. Chiba Daigaku Kankyo Kagaku Kenkyu Hokoku (Environ. Sci. Rep. Chiba Univ.), 1(1):69-72, July 1973. 4 refs.*

Microorganism capable of ingesting carbon monoxide and oxidizing it to carbon dioxide were studied. Carbon monoxide is consumed after being introduced in a container with soil inside. If CO is repeatedly delivered to the container, the CO disappearance velocity increases. Ingestion of CO by bacteria is not observed when soils are compressed so that inter-soil space disappears or oxygen in the air is substituted by nitrogen. Carbon monoxide-14 was swiftly ingested by bacteria. Carbon-14, however, started to disappear 5 days after ingestion. It must be discharged from the body of bacteria into the air after 14CO is ingested by bacteria. It is still not clear whether 14C is discharged in the form of 14CO or 14CO2. In order to solve this problem, bacteria were cultivated by solid culture. Bacteria which absorbed CO were floated in physiological saline solution. Bichloride of mercury was then added to kill the bacteria. As a result CO2 was detected instead of CO. Carbon monoxide, therefore, must be oxidized swiftly.

46052 **APTIC NO. 68818**

Kirsh, A. A. and I. B. Stechkina

THE FLOW FIELD AND DIFFUSIONAL SEDIMENTATION OF AEROSOLS IN THE SIMPLIFIED MODEL OF THE POLYDISPERSE FIBER FILTER. *(Pole techeniya i diffuzionnoye osazhdeniye aerozoley v prosteyshey modeli polidispersnogo voloknistogo fil tra). Text in Russian. Izv. Akad. Nauk SSSR Mekh. Zhidk. Gaza, no. 4:149-155, July-Aug. 1973. 7 refs.*

The flow field and diffusional sedimentation of aerosols was studied in a simplified polydisperse fiber filter model composed of parallel, equally spaced cylindrical fibers of different diameters, positioned perpendicular to the flow direction at low Reynolds numbers. It was possible to calculate the resistance and diffusional sedimentation of the particles on the basis of the mean diameter of the cylinders even if the radii differ from each other by a factor of several units. The flow resistance of moderately polydisperse fibers differed but slightly from that obtained for monodisperse fibers. At low degree of polydispersity of the fibers, the diffusional sedimentation of the aerosol particles can be calculated from the fiber mean diameter, while increasing polydispersity leads to a reduction of the proportion of diffusional sedimentation.

46053 **APTIC NO. 68857**

Kuhn, J. K., L. B. Kohlenberger, and N. F. Shimp

COMPARISON OF OXIDATION AND REDUCTION METHODS IN THE DETERMINATION OF FORMS OF SULFUR IN COAL. *Illinois State Geol. Surv., Environ. Geol. Notes, no. 66:1-11, Dec. 1973. 8 refs.*

Results obtained by analyzing nine coals for various sulfur forms using a lithium aluminum hydride (LAH) reduction method and a standard oxidation method (American Society for Testing and Materials) were compared to evaluate the effectiveness of the two methods for quantitative removal and subsequent determination of pyrite. Total iron and total sulfur were determined by X-ray fluorescence analysis of the whole coal. Each coal was ground to three different sizes (-60 mesh, -200 mesh, and -400 mesh) for studying the effects of particle size on pyritic sulfur values. The two methods produced comparable and reliable results in the determination of sulfur varieties in coal ground to a very fine particulate size (-400 mesh), though pyritic sulfur values obtained by the LAH reduction method showed a general increase as the coal particle size decreased. Agreement between total iron values as determined by X-ray fluorescence and ASTM procedures indicated that essentially all of the pyrite was removed from the coal samples by the ASTM method, and the values determined for sulfate sulfur and pyritic sulfur by either the ASTM or LAH method were therefore reasonably accurate. The ASTM method is more adaptable to the routine analysis of large numbers of coal samples, though the LAH reduction method is useful when sulfides other than pyrite are present or when additional information is required.

46054 **APTIC NO. 68596**

Miller, D. F. and Arthur Levy

ENVIRONMENTAL CHAMBER STUDIES OF ATMOSPHERIC AEROSOLS. *Battelle Memorial Inst., Columbus, Ohio, Columbus, Labs. Environmental Protection Agency Contract 68-02-0574, Proj. 21 AKB-9, Program Element 1AA008, Rept. EPA-650/4-74-009, 32p., Dec. 1973. 18 refs.*

Synthetic hydrocarbon-nitrogen oxide-air mixtures and automobiles exhaust-air mixtures were irradiated in a 610 cu ft smog chamber to obtain data for use by the Environmental Protection Agency in evaluating the role of primary auto-exhaust aerosol in the subsequent formation of photochemical aerosol and the relationships, if any, between photochemical-aerosol formation and eye irritation. Profiles of some of the parameters associated with aerosol indicated a very rapid increase in the aerosol number immediately after irradiation was initiated. The very brief induction period was the time required for the vapor of the incipient aerosols to reach critical concentrations at which nucleation began. The maximum in total number of nuclei occurred when the rate of coagulation equalled the rate of nucleation which beyond this point diminished as more surface became available to support condensation, thermodynamically a more favorable process. Shortly after the maximum in the total number curve, condensation appeared to be the prevailing mechanism by which aerosol volume increased. Experiments with human panelists exposed to the smog chamber contents indicated that the amount of aerosol surface and or volume had very little or no influence on eye irritation. Linear regression equations with two variables were obtained and correlation analyses were performed to describe the strength of the regression equations. Virtually no correlation between eye irritation and aerosol or peroxyacyl nitrate concentration appeared, and only moderate correlations between eye irritation and aldehyde concentrations were found.

46055 **APTIC NO. 68419**

Quan, Victor, Frank E. Marble, and James R. Kliegel

NITRIC OXIDE FORMATION IN TURBULENT DIFFUSION FLAMES. *Combustion Inst., Pittsburgh, Pa., Proc. Inst. Symp. Combust., 14th, University Park, Pa., 1972, p. 851-860, 1973. 12 refs. (Aug. 20-25.)*

Combustion and nitric oxide formation were investigated in the turbulent mixing region between parallel fuel and oxidant streams. Chemical reactions are divided into two classes: the fast, diffusion-limited combustion reaction, and the relatively slow, rate-limited NO formation. For the fast reaction, the turbulent mixing zone contains fuel, oxidants, and reaction products. The formation of NO is calculated separately as a trace species, since it has negligible effect on the flowfield. Transport of momentum, enthalpy, and chemical species are calculated using a mixing- length theory. Because NO generation is highly temperature sensitive, the history of combustion product gases, subsequent to their formation is decisive in determining the total NO production. Upper and lower bounds on NO production are obtained by considering that the combustion products remain undiluted and intact in the form of eddies as the turbulent field transports them throughout the mixing layer and the combustion products are locally mixed with cool oxidizer or fuel. These yield upper and lower limits, respectively. The time-averaged velocity, temperature, and concentrations of fuel, oxidant, products, and NO distributions are illustrated. Molecular mixing of turbulent eddies has a great influence on the amount of NO formed, although its effect on the time-averaged fluid properties is negligible. For a sample problem, the NO concentration obtained by assuming complete local molecular mixing is nearly an order-of-magnitude lower than the value predicted for no mixing. (Author abstract)

46056 **APTIC NO. 68312**

Sengupta, S. K. and S. Varma

EXTENT OF AMMONIA LOSS DURING PROCESSING OF DAP-BASED N-P OR N-P-K FORMULATIONS. *Technology (India), 10(1-2):117-118, 1973. 7 refs.*

The extent of ammonia loss during the drying of diammonium phosphate along with other nitrogenous, phosphatic, and potassic ingredients normally used in making multi-nutrient fertilizers was investigated. Ammonia liberated was absorbed in a known volume of sulfuric acid of known strength and was titrated with caustic soda. Except in a few cases, DAP drying was not attended with an increased evolution of ammonia. The extents of decomposition of DAP ammonium nitrate (1:1) and DAP-Urea (1:1) at 80 C for 30 and 120 min were 0.18 and 0.11% and 0.76 and 0.64%, respectively. No appreciable change was observed after decreasing the amount of ammonium nitrate. Systems of DAP- ammonium nitrate-potassium chloride and DAP-urea-potassium chloride exhibited decomposition as a cumulative effect of the two additives.

46057 **APTIC NO. 69121**

Stephens, Edgar R.

SUMMARY REPORT. JUNE 1973. HYDROCARBONS IN POLLUTED AIR. *California Univ., Riverside Calif., Statewide Air Pollution Research Center, Coordinating Research Council Proj. CAPA-5-68, 83p., June 1973. 14 refs.*

NTIS: PB-230993/AS

Flame ionization chromatography and irradiation studies are used to compare the distribution of hydrocarbons in the atmosphere with those observed in sources and to estimate the degree to which hydrocarbons of different reactivity participate in photochemical smog reactions. Typical photochemical smog hydrocarbons can be described as auto exhaust plus gasoline vapors plus natural gas (in addition to background methane of 1.39 ppm). Samples taken near specific sources (petrochemical plants, brush fires, oil fields) show distinctly different distributions. Afternoon smog samples show substantial attenuation of the more reactive hydrocarbons (specifically the olefins). Oxidant smog as seen in Riverside, California appears to undergo 6 to 8 hr of photochemical reaction, and irradiation produces continued reaction for 24 hrs or more. Even hydrocarbons of low reactivity participate in the reaction after 6 to 8 hr of irradiation, and after the first hour or so the olefins of high reactivity are gone and further reaction depends on hydrocarbons of medium and low reactivity. Hence, the reduction in already low concentrations of highly reactive olefins will not have much practical effect. Irradiation of ambient air mixtures confirmed the moderate reactivity of higher aromatics with eight carbons or more. (Author summary modified)

46058 **APTIC NO. 68391**

Environmental Protection Service, Ottawa (Ontario), Air Pollution Directorate

STANDARD REFERENCE METHOD FOR THE DETERMINATION OF PHOSPHORUS IN MOTOR FUEL (SPECTROPHOTOMETRIC METHOD). *Regulations, Codes and Protocols Rept. EPS 1-AP-73-4, 16p., July 1973.*

A method is described for determining phosphorus compounds in gasoline or other motor fuel. A sample of motor fuel is ignited on zinc oxide, the residue is dissolved in sulfuric acid, and the molybdenum blue color is developed, which is evaluated by spectrophotometry at the wavelength 820 nm. Using 5-centimeter cells, concentrations as low as 0.0012 mg phosphorus/gal can be determined. Greater sensitivity can be obtained using 10- centimeter cells. The calibration, procedure, reagents, and apparatus are described.

46059 **APTIC NO. 68392**

Environmental Protection Service, Ottawa (Ontario), Air Pollution Directorate

STANDARD REFERENCE METHOD FOR THE DETERMINATION OF LEAD IN MOTOR FUEL (ATOMIC ABSORPTION). *Regulations, Codes and Protocols Rept. EPS 1-AP-73-3, 18p., March 1973. 6 refs.*

An atomic absorption spectrophotometric method is described for determining lead in gasoline or other motor fuels. It compensates for variations in gasoline composition and is independent of the lead alkyl type. Concentrations in the range 0.010-0.10 g lead/Imp gal can be determined. Gasolines with a higher lead content require dilution with isooctane before measurement. The gasoline is diluted with methyl isobutyl ketone, and the alkyl lead compounds are stabilized by reaction with iodine and a quaternary ammonium salt. The Pb content is determined by atomic absorption flame spectrometry at 283 nm. Standards prepared from reagent grade lead chloride are used for calibration.

1972

46060 **APTIC NO. 68334**

Hui, Man-Him and Stuart A. Rice

DECAY OF FLUORESCENCE FROM SINGLE VIBRONIC STATES OF SO2. *Chem. Phys. Letters (Amsterdam), 17(4):474-478, Dec. 15, 1972. 16 refs.*

The fluorescence from 10 vibronic states in the 2300 to 2100 A absorption region of sulfur dioxide was studied. A sharp drop in fluorescence quantum yield and fluorescence lifetime for wavelengths shorter than 2206 A was attributed to the dissociation of SO2. The quantum yield of fluorescence in the spectral region where there was no dissociation was unity at zero pressure, within experimental error. Neither anomalously long lifetimes of fluorescence nor nonexponential decay of fluorescence were observed, indicating that there was weak coupling between the state(s) studied and other states. Comparison of experimental data with calculations based on RRKM theory suggested that energy randomization was not complete before dissociation, and that coupling between the symmetric bending mode and the asymmetric stretching mode was very weak. (Author abstract modified)

46061 **APTIC NO. 69140**

Volman, David H. and Robert A. Gorse

PHOTOCHEMISTRY OF THE GASEOUS HYDROGEN PEROXIDE-CARBON MONOXIDE SYSTEM: RATE CONSTANTS FOR HYDROXYL RADICAL REACTIONS BY COMPETITIVE KINETICS (FINAL REPORT). *California Univ., Davis, California Air Resources Board Contract 023, ARB Proj. 5-143-2, 21p., 1972. 12 refs.*

The reaction between hydrogen peroxide and carbon monoxide initiated by absorption of 254 nm light at 298 K in a static system was studied. Hydroxyl radicals were formed in the primary process and reacted with carbon monoxide to yield carbon dioxide and hydrogen atoms. Hydrogen atoms reacted with hydrogen peroxide either to yield water and OH or to yield hydrogen and HO2. For these processes the rate constant ratio was k(H2O)/k(H2) equals 2.0-4.0. With sufficient added oxygen, hydrogen atoms reacted only with oxygen to yield HO2, and it was possible to obtain a rate constant for the reaction of OH with H2O2. With both oxygen and isobutane added, it was possible to obtain a rate constant for the reaction of OH with (CH3)3CH. The constants obtained were k(OH + H2O2) equals 0.9-1.5 times 10 to the -12th power and k(OH + (CH3)3CH) equals 2.7-4.3 times 10 to the -12th power cu cm/molecule/sec. Preliminary results for the reaction with propionaldehyde were also obtained, yielding the tentative rate constant k(OH + (C2H5)CHO) equals 2.3-5.3 times 10 to the -12th power cu cm/molecule/sec. (Author abstract)

1971

46062 **APTIC NO. 68365**

Yablochkin, V. D., A. M. Popov, A. I. Gorshunova, V. A. Shchirskaya, Y. V. Kolchina, and E. I. Chukhno

INVESTIGATION OF VOLATILE SUBSTANCES RELEASED BY POLYMER CONSTRUCTION MATERIALS. I. BLOCK, SHEET AND GRANULATED PLASTICS. *In: Current Problems in Space Biology and Medicine (Aktual nyye voprosy kosmicheskoy biologii i meditsiny), 1971, p. 294-299. Translated from Russian. Joint Publications Research Service, Arlington, Va., 8p., July 14, 1972.*

NTIS: JPRS 56499

Chemical spectrophotometric, and gas chromatographic analyses were used to study the release of volatile substances from block, sheet, and granulated plastic construction materials. Most of the investigated materials contained considerable quantities of volatile organic substances, with exceptions being polycapramide and pressed powder phenol-formaldehyde resin. The highest content of volatile organic substances was observed in milk glass containing polymethyl methacrylate ester polymer, and butadiene-styrene-acrylonitrile copolymer (ABC resin). A sample of methyl methacrylate plastic released no volatiles at normal temperature (20-40 C); at 60 C, however, acetone and methyl methacrylate were observed. Another sample of plastic glass based on polymethyl methacrylate released methyl methacrylate, methyl acrylate, methylethyl ketone, and carbon monoxide. The ABC resin released styrene, acrylonitrile, and aliphatic hydrocarbons at 70 C, though at 20 C none of these products were observed. A polycarbonate (diflon) released the solvents acetone and methylene chloride at 40 C. Phenol-formaldehyde plastics released formaldehyde at temperatures up to 100 C, with phenol being detected at 150 C. Carbon monoxide and ammonia were also observed in the gaseous phase over this sample at 150 C.

46063 **APTIC NO. 68366**

Yablochkin, V. D., V. A. Shchirskaya, A. M. Popov, A. I. Gorshunova, Y. V. Kolchina, and E. I. Chukhno

STUDY OF VOLATILE SUBSTANCES RELEASED BY POLYMER CONSTRUCTION MATERIALS. III. FOAM AND POROUS PLASTICS BASED ON POLYSTYRENE AND POLYURETHANE. *In: Current Problems in Space Biology and Medicine (Aktual nyye voprosy kosmicheskoy biologii i meditsiny), 1971, p. 301-305. Translated from Russian. Joint Publications Research Service, Arlington, Va., 7p., July 14, 1972.*

NTIS: JPRS 56499

Chemical, spectrophotometric, and gas chromatographic analyses were used to study the release of volatile products from nine samples of polystyrene and polyurethane foams and porous plastics subjected to various temperatures. All of the investigated materials both at normal and high temperatures released a diverse complex of volatile chemical substances. Polymer materials based on polystyrene released the olefin monomer styrene; in addition to the monomer, emulsion polystyrene released the solvents acetone, ethanol, toluene, and meta- and para-xylenes. Solvents were not found in the complex of products released from other polystyrene samples, though some nonspecific products of the aging such as carbon monoxide, carbon dioxide, and hydrocarbons were discovered. Ethyl benzene was found in the gases released from one of the emulsion polystyrene samples. Hard polyurethane foam plastics did not release volatile substances at 40 C, but with an increase in temperature up to 100 C the release of tolylene diisocyanate and the thermooxidative decay products CO, CO2, nitrogen oxides, and unsaturated hydrocarbons occurred. Elastic foam polyurethanes released butanol in addition to the substances detected in the decomposition of hard foam polyurethanes. Thermooxidative destruction of the elastic polyurethanes occurred at 200 C with the formation of hydrogen cyanide, ethylene oxide, and other volatile substances.

1968

46064 **APTIC NO. 65996**

Galtsev, A. P. and V. M. Osipov

DETERMINATION OF THE ABSORPTION FUNCTION OF OZONE BANDS WITH THE CONSIDERATION OF THEIR FINE STRUCTURE. *World Meteorological Organization, Geneva (Switzerland) and International Union of Geodesy and Geophysics, Paris (France), Radiat. Incl. Satell. Tech., Proc. WMO/IUGG Symp., Bergen, Norway, 1968, WMO TN 104, 248, TP 136, p. 165-169. 5 refs. (Aug.)*

The absorption function of ozone bands was investigated. The absence of a satisfactory model for the vibrational-rotational O3 band spectrum prevents a sufficiently accurate determination of the transmission function for wide variations in O3 and pressure using simple model calculations. Use was made of models allowing for fine structure of the band for calculating the transmission function of the narrow spectral intervals of the 4.7 and 9.6 micron bands. A modified statistical model was used to allow for the real-line intensity distribution.

46065 **APTIC NO. 66020**

Kondratyev, K. Y., Y. M. Timofeev, O. M. Pokrovsky, A. N. Tikhonov, and V. B. Glasko

ON THE SOLUTION OF SOME INVERSE PROBLEMS OF ATMOSPHERIC OPTICS. *World Meteorological Organization, Geneva (Switzerland) and International Union of Geodesy and Geophysics, Paris (France), Radiat. Incl. Satell. Tech., Proc. WMO/IUGG Symp., Bergen, Norway, 1968, WMO TN 104, 248, TP 136, p. 357-362. 11 refs. (Aug.)*

The solution of some inverse problems of atmospheric optics is described. Inverse problems consist in determining the atmospheric composition or structural parameters from the data of measuring the quantitative characteristics of the radiation field. No methods are available for the direct experimental determination of transmission function derivatives. The functions sought are assumed to be time independent. This is fulfilled with sufficient accuracy for carbon dioxide or oxygen transmission functions with a small temperature dependence.

1954

46066 **APTIC NO. 68870**

Behnke, Albert R.

BASIC ODOR RESEARCH CORRELATION: INTRODUCTION. *Ann. N. Y. Acad. Sci., 58(2):15-21, March 24, 1954. 9 refs.*

The lack of information on olfaction and the correlation of anatomical structures with olfactory functions are discussed. The nature of the olfactory process is described. The effects of enzymes, the relationship between the chemical composition of the odorant and olfaction, adaptation, and experimental advances in olfaction research are reviewed.

46067 **APTIC NO. 68877**

Hainer, R. M., A. G. Emslie, and Ada Jacobson

AN INFORMATION THEORY OF OLFACTION. *Ann. N. Y. Acad. Sci., 58(2):158-174, March 1954. 18 refs.*

A new theory of olfaction is described synthesized from knowledge of the subjective olfactory experience, the neurophysiology of the olfactory system, and the requirements for the storage and transmission of information. The general informational theory proposed is applicable to all sensory systems. It states that a valid approach to perception can be found by evaluating the informational capacity (the capacity for different patterns of the transmitting neurons alone), and by comparing this capacity for different patterns with the subjectively perceived and counted information of the sense in question (the number of odors and intensity differences). The requirements for the communication of information, formulation of the model, and the neurophysiological aspects of olfaction are reviewed. Two important features of olfaction are adaptation and fatigue, both of which take place on continued exposure to constant, homogeneous odorants. Applications of the odor theory to a method of classification of odor and to deodorization are discussed.

46068 **APTIC NO. 68874**

Mateson, Jean F.

THE OLFACTORY AREA AND THE OLFACTORY RECEPTOR PROCESS. *Ann. N. Y. Acad. Sci., 58(2):83-95, March 1954. 15 refs.*

The olfactory area and its receptor mechanism are reviewed. Since the olfactory area is not a separate organ, but rather a specialized cell area of the upper respiratory epithelium, it is unwise to limit investigations of olfaction strictly to receptor end organs or anatomy. Therefore, the participation of the whole nasal area in the perception of odorants is reviewed. The various areas of the nose, head, and sinuses involved in olfaction, as well as the receptor process are discussed.

46069 **APTIC NO. 68873**

Moncrieff, R. W.

THE ODORANTS. *Ann. N. Y. Acad. Sci., 58(2):73-82, March 1954. 24 refs.*

Natural odors include animals, vegetables, and flowers. Industrial odors include coal gas, acetylene, engine exhausts, and tobacco smokes. For a substance to be odorous, it must be at least slightly volatile, and it must be soluble in the fatty parts of the olfactory apparatus. Many substances are both volatile and fat-soluble, but not odorous. Therefore, a third requirement for an odorant consists of some form of inter- or intramolecular vibration. Those substances which are chemically reactive often have strong odors. Although there is some evidence of the dependence of odor on chemical constitution, the relation is not straightforward. There are many inconsistencies and anomalies. If it is postulated that odor is due to a combination of volatility, lipid solubility, and molecular shape, it is possible to account satisfactorily for most of the observed olfactory phenomena.

46070 **APTIC NO. 68875**

Mozell, Maxwell M. and Carl Pfaffmann

THE AFFERENT NEURAL PROCESSES IN ODOR PERCEPTION. *Ann. N. Y. Acad. Sci., 58(2):96-108, March 1954. 16 refs.*

The afferent neural processes in the olfactory bulb as they have been uncovered by means of the electrophysiological method are reviewed. The histology of the area is especially important because the elements in the olfactory bulb giving the responses cannot be observed directly during the recording session. Most of the work on the physiology of the olfactory bulb has been based on the work of E. D. Adrian. Although this method is so far applicable only at the level of the secondary olfactory neurons, much information concerning the differential character of the olfactory responses can be obtained. There is both temporal and spatial differentiation of activity in the bulb. The spatial differentiation may be observed at a gross level such that the anterior bulb in the rabbit yields relatively greater activity to some classes of odorants than to others. This spatial differentiation is maintained with suprathreshold stimuli in terms of the relative magnitudes of responses to different substances in different regions of the bulb. Studies of activity in the individual mitral cells indicate that there is a selective sensitivity for one substance or closely related substances. However, it does not appear likely that there are only a limited number of primary receptor types. The evidence suggests that odor discrimination depends upon the cooperation of a number of factors giving information about different properties of the stimulating agent. (Author summary modified)

46071 **APTIC NO. 68876**

Pribram, Karl H. and Lawrence Kruger

FUNCTIONS OF THE OLFACTORY BRAIN. *Ann. N. Y. Acad. Sci., 58(2):109-138, March 1954. 169 refs.*

Renewed interest in the olfactory brain or rhinencephalon has been provoked by the suggestion that in mammals this portion of the brain serves emotional rather than olfactory functions. Recent theoretical and experimental studies examined various aspects of this suggestion. There has arisen a certain amount of confusion due to discrepancies in results. These discrepancies are discussed. The morphology of the rhinencephalon, classification of rhinencephalic systems, experimental histology, electrographic anatomy, systematization of rhinencephalic formations, functions of rhinencephalic systems, experimental physiology and psychology are discussed.

46072 **APTIC NO. 68872**

Sumner, James B.

PROBLEMS IN ODOR RESEARCH FROM THE VIEWPOINT OF THE CHEMIST. *Ann. N. Y. Acad. Sci., 58(2):68-72, March 1954. 12 refs.*

The relationship between enzymes and odor is discussed. Several theories have proposed that odor-producing substances affect the catalyst balance of the olfactory cells by modifying the existing catalysts, by forming new catalysts, or by inhibiting all or a part of the activity of normal cellular catalysts. The mechanism by which odorous substances are able to stimulate the olfactory receptors has been said to be caused by the production of infrared waves by odorous substances. These radiation theories are unconvincing. It seems likely that the primary source of energy for the process of smelling is the breakdown of adenosine triphosphate. Several statements on odor are discussed. The role of the biochemist in studying olfaction is reviewed, and a theory of olfaction is presented.

EFFECTS-HUMAN HEALTH

1975

46073 **APTIC NO. 69122**

Crist, Howard L., Robert F. Moseman, and Jack W. Noneman

RAPID DETERMINATION AND CONFIRMATION OF LOW LEVELS OF HEXACHLOROBENZENE IN ADIPOSE TISSUES. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Pesticides and Toxic Substances Effects Lab., 11p., 1975 (?). 11 refs.*

A gas chromatographic procedure for the rapid quantitation and confirmation of hexachlorobenzene in fatty tissue at levels as low as 5 ppb is described. Hexachlorobenzene (HCB) is widely used as a fungicide as well as in the manufacture of industrial products such as plastics and fireproofing materials. The method involves dissolving approximately 500 mg of animal fat fortified with HCB in 1-2 ml hexane and transferring the sample with a disposable pipet to a 100 mm Florisil column which is topped with 12 mm sodium sulfate and prewashed with hexane. Elution is performed with 100 ml hexane at a flow rate of 5 ml/min. The volume of solvent is reduced by steam evaporation and a nitrogen steam to variable volumes depending on the HCB concentration. Standard solutions of HCB are kept from evaporating by the addition of 5 drops of 1% paraffin oil in hexane. An aliquot is then injected into the gas chromatograph and compared with standards. Interferences can be circumvented in many instances without additional separation by selection and preparation of the appropriate derivative. A series of different amounts of HCB standard which was converted to its derivative bis-isopropoxytetrachlorobenzene demonstrates the linearity of the reaction. Recoveries from HCB from fortified chicken fat are tabulated and range from 86-107%.

1974

46074 **APTIC NO. 64425**

Baykov, B. K., O. Y. Gorlova, M. I. Gusev, Y. V. Novikov, T. V. Yudina, and A. N. Sergeyev

HYGIENIC STANDARDIZATION OF THE DAILY AVERAGE MAXIMAL PERMISSIBLE CONCENTRATIONS OF PROPYL AND ISOPROPYL ALCOHOLS IN THE ATMOSPHERE. *(Gigiyenicheskoye normirovaniya srednesutochnykh predel no dopustimykh kontsentratsiy propilovogo i izopropilovogo spirtov v atmosfernom vozdukhe). Text in Russian. Gigiena i Sanit., no. 4:6-13, 1974. 4 refs.*

The acute and chronic effects of various concentrations of propyl and isopropyl alcohols were studied in albino rats for the determination of the maximum allowable daily average concentrations of these alcohols in the air. In rats inhaling 20 mg/cu m propyl alcohol and isopropyl alcohol for three months, changes in the latency time of the unconditioned defense reaction, increased number of leukocytes with altered luminescence, reduced nucleic acid level, reduced oxidase and catalase activities in the blood, reduced rate of bromosulfalein elimination, and reduced coproporphyrin level in the urine were observed along with pathological changes in the lungs, liver, spleen, and the central nervous system. The above changes were less pronounced in rats exposed to 1.25 mg/cu m propyl alcohol and 2.5 mg/cu m isopropyl alcohol. Propyl and isopropyl alcohol concentrations of 0.3 mg/cu m and 0.6 mg/cu m, respectively, were found ineffective in acute inhalation tests, and are recommended as the maximum daily average allowable concentrations of these alcohols in the air.

46075 **APTIC NO. 69683**

Biggin, H. C., N. S. Chen, K. V. Ettinger, J. H. Fremlin, W. D. Morgan, R. Nowotny, M. J. Chamberlain, and T. C. Harvey

CADMIUM BY IN VIVO NEUTRON ACTIVATION ANALYSIS. *J. Radioanal. Chem., vol. 19:207-214, 1974. 13 refs.*

A neutron activation method is described capable indicating the presence of cadmium in man in vivo; quantitative determinations may be possible in the future. The sensitivity of the method is such that the detection threshold lies within the accepted normal concentrations and is significantly below the encountered toxic levels. The method can be used for screening cadmium poisoning suspects since the radiation dose necessary for this purpose can be made as low as 0.5 rem. Another possible application of the technique is the study of the role of cadmium in renal disorders, bone disease, and hypertension. The measurement takes less than 0.5 hr with a minimum of discomfort to the patient. Most of the experimental results presented were obtained from measurements on phantoms (simulated chest sections). Author conclusions modified)

46076 **APTIC NO. 69895**

Brubaker, Paul E., John B. Moran, Kenneth Bridbord, and F. Gordon Hueter

NOBLE METALS. A TOXICOLOGICAL APPRAISAL OF POTENTIAL NEW ENVIRONMENTAL CONTAMINANTS. *Preprint, National Inst. of Health, Research Triangle Park, N. C., National Inst. of Environmental Health Sciences and Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Development, 52p., 1974. 111 refs. (Presented at the Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Durham, N. C., April 16-19, 1974.)*

A toxicological appraisal is given of potential new environmental catalysts from automobiles. The use of catalytic converters may represent a source of new environmental agents of broad distribution potential, the attrition products of platinum-group metals. The past national consumption and use of noble metals and their potential for future environmental contamination are discussed. Information from reported industrial hygiene experience is reviewed. Exposure levels are estimated under various meteorological conditions. Immediate and delayed hypersensitivity, carcinogenicity, and biotransformation (methylation) related to the use of noble metals (platinum, palladium, ruthenium, osmium, rhodium, and iridium) are discussed. Platinum and palladium can be absorbed into biological tissues when administered to experimental animals by various exposure routes. Soluble platinum compounds are more toxic than other metals of interest (manganese and lead) when administered orally. However, palladium is more toxic than these metals when administered intravenously. Absorbed noble metals can traverse the placental barrier in pregnant experimental animals. Preliminary cardiovascular studies suggest that palladium can act as a nonspecific cardiac irritant as well as a peripheral vasoconstrictor in experimental animals. At the present time, there is relatively little contamination of platinum in human tissues. Low levels of platinum and noble metal compounds can cause immunological and allergic responses. It may be necessary to discontinue use of catalytic converters to regulate noble metal attrition products.

46077 **APTIC NO. 68718**

Chandra, Satya V., P. K. Seth, and J. K. Mankeshwar

MANGANESE POISONING: CLINICAL AND BIOCHEMICAL OBSERVATIONS. *Environ. Res., 7(3):374-380, June 1974. 19 refs.*

Clinical and biochemical blood and urine studies were conducted on 12 manganese miners suspected of having manganese poisoning. The patients were divided into three grades of poisoning on the basis of neurological observations: mild, moderate, and severe. A significant increase in serum calcium and adenosine deaminase levels was observed in cases of mild and moderate grades of poisoning, with the serum calcium increase being twofold and the adenosine deaminase increase being threefold in the severe poisonings as compared to normal volunteers. Serum inorganic phosphates, alkaline phosphatase, and proteins were not altered. No relationship was established between the period of exposure to manganese and the severity of poisoning. Serum calcium levels appeared to be of great significance in detecting manganese poisoning in its early stages; significant changes in adenosine deaminase levels did not become manifested until moderate poisoning occurred. (Author abstract modified)

46078 **APTIC NO. 68377**

Chapman, R., J. French, J. Finklea, C. Hayes, and G. Love

INCREASED RISK OF ACUTE AND CHRONIC RESPIRATORY DISORDERS FOLLOWING LONG-TERM AIR POLLUTION EXPOSURES. *Preprint, Coordinating European Council, Environmental Protection Agency, Washington, D. C., World Health Organization, 14p., 1974. 8 refs. (Presented at the International Symposium, Recent Advances in the Assessment of the Health Effects of Environmental Pollution, Paris, France, June 24-28, 1974.)*

Epidemiologic surveys relating long-term air pollution exposures to the prevalence of chronic respiratory disease and the incidence of acute respiratory disease are summarized. In four chronic respiratory disease (CRD) studies, chronic bronchitis prevalence was elevated in neighborhoods of elevated pollution exposure. Reduced rates of acute respiratory disease (ARD) resulted from improvements in existing air quality. In Chicago, reduction of annual average sulfur dioxide levels from 100 micrograms/cu m to 57 micrograms/cu m, and of suspended sulfate (SS) levels from 18 micrograms/cu m to about 14 micrograms/cu m promoted reductions in total ARD incidence. In New York, the 1-3 year exposure to annual average SO2 levels of 250 micrograms/cu m, accompanied by SS levels of about 22 micrograms/cu m, and total suspended particulate levels of 94-117 micrograms/cu m was associated with a significant increase in the incidence of acute lower respiratory illness. (Author summary modified)

46079 **APTIC NO. 68544**

Dawson, G. W.

THE CHEMICAL TOXICITY OF ELEMENTS. *Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Water and Land Resources Dept., Atomic Energy Commission Contracts AT(45-1)-2130 and AT(45-1)-1830, Rept. BNWL-1815, UC-70, 26p., June 1974. 28 refs.*

NTIS: BNWL-1815

The chemical hazards of radioactive waste materials from the nuclear industry are reviewed. Acceptable threshold levels are given for the 104 known elements in the air and water. The basis by which the chemical toxicity thresholds were selected is discussed in an appendix. Knowledge of acceptable body burdens and chronic administration levels is restricted to a very few elements. Consequently, it is necessary to estimate chronic exposure thresholds from acute effect data or from chemical similitude to other elements for which toxicological data have been gathered.

46080 **APTIC NO. 69100**

Fagley, Walter

OVERVIEW DISCUSSIONS -- FRIDAY, APRIL 19, 1974. *Preprint, National Inst. of Health, Research Triangle Park, N. C., National Inst. of Environmental Health Sciences and Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Development, 7p., 1974. (Presented at the Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Durham, N. C., April 16-19, 1974.)*

The conference on the impact of emission controls and catalytic converters is reviewed. From 1940 to 1970, sulfur oxides in the air in the U. S. increased from 21 to 34 million tons. At sulfate levels of 25 micrograms/cu m and above, there is a significant increase in mortality rate. There appears to be no generally accepted measuring technique to measure sulfates. One study on the changes in human exposure to sulfates due to oxidation catalysts indicated that during the second year of equipping cars with catalysts, the point of adverse effects would be reached. Another study showed sulfate and not sulfur dioxide caused adverse effects on asthmatics, and when the temperature was above 50 F the situation was worse. Studies in guinea pigs, rats, and monkeys were conducted to see if synergisms existed with humidity, fly ash, sodium chloride, SO2, and sulfates. Red haired, blue-eyed people with freckles were found to be the most susceptible to platinum salts emitted by noble metal catalytic converters in another study. An automatic technique for measuring sulfates in constant volume sampler diluted auto exhausts, a method for measuring SO2, a method of converting SO2 to sulfate, and a method for measuring sulfuric acid in auto exhausts were also discussed at the conference. One study was conducted that showed that ethylenedibromide rather than lead is the catalyst poison. In another study, hydrogen sulfide and phosphine were found to be emitted from automobiles equipped with catalytic converters. In other papers, sulfate measurement methods, particulate emission measurements, trace metal studies, and fuel desulfurization were discussed.

46081 **APTIC NO. 68382**

Ferens, M. Catherine

A REVIEW OF THE PHYSIOLOGICAL IMPACT OF MERCURIALS. *Georgia Univ., Athens, Savannah River Ecology Lab., Environmental Protection Agency Research Grant R-800510, Proj. R-800510, Program Element 1BA023, EPA-660/3-73-022, 60p., Feb. 1974. 138 refs.*

NTIS: PB-234 644

Literature on the biological effects of mercurials was reviewed to assess their impact on individual organisms in terms of biochemical or cellular damage. Mercurialism is manifested primarily in kidney or brain damage in animals and in growth reduction in plants. Exposure to inorganic mercury compounds usually results in kidney damage while alkyl mercurialism is characterized by brain damage. Some degree of both kidney and neurological injury results from exposure to either category of mercurials. Kidney injury is due apparently to damage of Kreb s cycle enzymes, thus reducing available energy to actively resorb ions. Impaired protein synthesis as well as reduction in activity of Kreb s cycle enzymes may be important in brain damage resulting from mercury poisoning. Photosynthetic damage is apparently the biochemical basis of mercurial effects observed in plants. (Author abstract modified)

46082 **APTIC NO. 69093**

Finklea, John F., John Moran, John H. Knelson, D. B. Turner, and L. E. Niemeyer

ESTIMATED CHANGES IN HUMAN EXPOSURE TO SUSPENDED SULFATE ATTRIBUTABLE TO EQUIPPING LIGHT DUTY MOTOR VEHICLES WITH OXIDATION CATALYSTS. *Preprint, National Inst. of Health, Research Triangle Park, N. C., National Inst. of Environmental Health Sciences and Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Development, 18p., 1974. 3 refs. (Presented at the Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Durham, N. C., April 16-19, 1974.)*

The potential environmental impact of equipping vehicles with oxidation catalysts is estimated. Three independent techniques are used to appraise community exposures to sulfates which might result from the use of catalytic control devices. Incremental increases in suspended sulfates and sulfuric acid aerosols are evaluated in terms of the number of vehicles equipped with oxidation catalysts. In one approach to estimate exposure, dispersion models developed for emissions of stable gases from motor vehicles and ambient carbon monoxide data were used to estimate sulfate air quality changes. A second estimate was made using carboxyhemoglobin levels in nonsmokers living in major cities to estimate both existing CO exposures and anticipated incremental sulfate exposures. A third technique used lead surrogate data to estimate short-term incremental sulfate concentrations. Adverse health effects among the most susceptible group of commuters traversing the busiest highways are likely to appear by the end of the second model year in which catalytic converters are used. (Author abstract modified)

46083 **APTIC NO. 69107**

Ginsberg, Myron D. and Ronald E. Myers

EXPERIMENTAL CARBON MONOXIDE ENCEPHALOPATHY IN THE PRIMATE. I. PHYSIOLOGIC AND METABOLIC ASPECTS. *Arch. Neurol. (Chicago), vol. 30:202-208, March 1974. 40 refs.*

Physiologic and metabolic changes associated with experimental carbon monoxide encephalopathy in 19 rhesus monkeys receiving single doses of the gas were studied. All animals receiving 0.2-0.3% CO developed 2-3 sec slow waves in the frontal electroencephalogram within 60 min of initiation of CO exposure, and this change was commonly followed by moderate-to-high amplitude 1/sec waves during the second or third hour of CO exposure. Intermittent isoelectric intervals during 10-95% of the EEG tracing in the later stages of CO insult were observed in 12 animals, and these isoelectric changes often coincided with periods of greatly reduced arterial blood pressure. Inhalation of 0.2% CO led to stable plateau levels of blood carboxyhemoglobin which averaged 76%. The mean arterial blood oxygen content of these animals declined to 4.2 ml/100 ml. Arterial oxygen pressure remained normal. The jugular venous oxygen content exceeded that of the central venous blood during and following the intoxication. Arterial hypotension and metabolic acidosis evolved consistently though to a variable extent. The central venous pressure remained unaltered. Severe respiratory depression occurred only rarely, whereas cardiac arrhythmias constituted a major risk to life during the actual exposure. Ventricular fibrillation occurred in four animals and was fatal in two but could be largely prevented by the use of lidocaine prophylactically. Arterial hypotension led to the death of two animals. (Author abstract modified)

46084 **APTIC NO. 68568**

Goldstein, Joyce A., Patricia Hickman, Virlyn W. Burse, and Hinda Bergman

A COMPARATIVE STUDY OF TWO POLYCHLORINATED BIPHENYL MIXTURES (AROCLORS 1242 AND 1016) CONTAINING 42% CHLORINE ON INDUCTION OF HEPATIC PORPHYRIA AND DRUG METABOLIZING ENZYMES. *Preprint, Environmental Protection Agency, Research Triangle, N. C., National Environmental Research Center, 28p., 1974 (?). 38 refs.*

The effects of Aroclor 1242 and Aroclor 1016 (two polychlorinated biphenyls) on induction of experimental hepatic porphyria and induction of drug metabilizing enzymes were compared after feeding female rats dietary levels of 100 ppm and 500 ppm. Aroclor 1242 contains 42% chlorine and 9% biphenyl homologs with five or more chlorines compared to 41% chlorine and 1% biphenyl homologs for Aroclor 1016. Aroclor 1242 produced marked increases in liver weight and all drug metabolizing pathways tested including cytochrome P-450, liver weight, N-demethylase, nitroreductase, aniline hydroxylase, and glucuronyl transferase at 1 wk, while Aroclor 1016 produced only very minimal increases at this time. After 6 mo 500 ppm Aroclor 1016 produced marked increases in a number of parameters similar to increases produced by an identical dose of Aroclor 1242 but was still less potent than Aroclor 1242 at this time. Both doses of Aroclor 1242 produced porphyria while only the higher dose of Aroclor 1016 was porphyrogenic. The porphyria occurred after a lag period which ranges from 1-6 mo and was characterized by excretion and hepatic storage of uroporphyrins. (Author abstract modified)

46085 **APTIC NO. 69123**

Graham, Judith A., Donald E. Gardner, Michael D. Waters, and David L. Coffin

EFFECT OF TRACE METALS ON PHAGOCYTOSIS BY ALVEOLAR MACROPHAGES. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Pathobiology Research Branch, 21p., 1974 (?). 25 refs.*

The effects of various trace metals on phagocytosis by alveolar macrophages obtained from healthy New Zealand white rabbits were studied with a technique which permitted the examination of only live cells. An accurate phagocytic index was obtained by counting 200 live alveolar macrophages, determining the percent of these macrophages containing intracellular spheres (percent phagocytosis), and converting this percentage to a percent of control to yield the phagocytic index. Divalent nickel selectivity altered the phagocytic activity of the macrophages at concentrations which failed to cause cell death (0.00011 M), whereas vanadate caused extensive lysis and cell death at concentrations which did not reduce phagocytosis (0.000069 M). Intermediate results were observed with divalent cadmium (0.000022 M), divalent manganese (0.0018 M), and trivalent chromium (0.0031 M). Cadmium exposure resulted in comparable levels of physical and functional damage, whereas slightly more functional than physical damage resulted from exposures to manganese and chromium. Certain metallic air pollutants appear to cause functional defects in the alveolar macrophage which may be linked to infectious pulmonary disease. The importance of measuring several different parameters, such as viability and phagocytosis, when determining the toxicity of unknown substances is underscored by the different mechanisms of action illustrated for metals.

46086 **APTIC NO. 69091**

Holbrook, David J., Jr., Mildred E. Washington, Hansford B. Leake, and Paul E. Brubaker

STUDIES ON THE EVALUATION OF THE TOXICITY OF VARIOUS SALTS OF LEAD, MANGANESE, PLATINUM, AND PALLADIUM. *Preprint, National Inst. of Health, Research Triangle Park, N. C., National Inst. of Environmental Health Sciences and Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Development, 24p., 1974. 6 refs. (Presented at the Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Durham, N. C., April 16-19, 1974.)*

Preliminary studies were conducted on various parameters in order to assess the possible and relative toxicities of a number of metallic salts. The chloride, sulfate, and oxide salts of lead, manganese, platinum, and palladium were studied since some of these salts may be included in automotive emission products. Upon oral administration in lethal-dose experiments, two soluble platinum (Pt (4+)) salts were more toxic to rats than the other salts tested. Following intraperitoneal injection in lethal-dose experiments, lead chloride was less toxic than several of the soluble or partially soluble salts of platinum, lead, and manganese. An intake of a total of approximately 250 mg of Pt(4+) per rat in the drinking fluid over a 30-day interval did not affect the activities of aniline hydroxylase and aminopyrine demethylase in rat liver microsomes. In rats receiving soluble platinum salts in the drinking fluid, the highest concentration of platinum was found in the kidney, and an appreciable concentration was found in the liver. (Author abstract modified)

46087 APTIC NO. [illegible]

Hysell, D. K., W. Moore, R. Hinners, M. Malanchuk, R. Miller, and J. F. Stara

THE INHALATION TOXICOLOGY OF AUTOMOTIVE EMISSIONS AS AFFECTED BY AN OXIDATION EXHAUST CATALYST. *Preprint, National Inst. of Health, Research Triangle Park, N. C., National Inst. of Environmental Health Sciences and Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Development, 20p., 1974. 2 refs. (Presented at the Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Durham, N. C., April 16-19, 1974.)*

Preliminary data are given on the acute inhalation toxicology of automotive emissions as affected by an oxidation exhaust catalyst. The catalyst effectively reduced carbon monoxide and hydrocarbons in the exhaust. It also apparently had an effect (at least in a closed exposure system) on oxidant and nitrogen dioxide levels by altering the hydrocarbon/nitrogen oxide ratio. There was a resultant reduction in biological effects due to the exposure in tests on albino rats. The catalyst altered the type of particulate to one which probably contained sulfuric acid as a major component. No evidence was present in these acute exposures to suggest a toxic response due to the higher sulfate emissions or possible catalyst attrition products. The effects of long-term exposure have not been investigated as yet. (Author abstract modified)

46088 APTIC NO. [illegible]

Johnson, D. E., J. B. Tillery, and R. J. Prevost

TRACE METALS IN OCCUPATIONALLY AND NON-OCCUPATIONALLY EXPOSED INDIVIDUALS. *Preprint, National Inst. of Health, Research Triangle Park, N. C., National Inst. of Environmental Health Sciences and Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Development, 21p., 1974. 17 refs. (Presented at the Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Durham, N. C., April 16-19, 1974.)*

An epidemiological survey was conducted in Houston, Texas, on five trace elements in policemen, parking garage attendants, women living near freeways, and three control groups of subjects. The controls were matched with the exposed groups for covariate information such as age, sex, smoking habits, ethnic background, socio-economic status, hair color, and education. Each subject was sampled four times for blood, urine, hair, and feces, and these samples were analyzed for lead, cadmium, zinc, manganese, and copper. Lead and cadmium were correlated with airborne exposures, but zinc, manganese, and copper were not. A market study was made of platinum and palladium which might be used in catalytic muffler systems. Epidemiological procedures were developed for use in monitoring body burdens of the general population for platinum and palladium. The market survey showed that although the catalytic muffler will have a major impact on the market, it is predicted that producers can meet these demands. (Author abstract modified)

46089 APTIC NO. 68781

Katsnel son, B. A. and B. T. Velichkovskiy

EVALUATION OF THE DANGER OF FIBROGENIC DUST. *(Otsenka opasnosti fibrogennykh pyley). Text in Russian. Zh. Vses. Khim. Obshchestva Im D I Mendeleeva, 19(2):205-212, 1974. 78 refs.*

Studies on the evaluation of the cytotoxicity and fibrogenicity of dusts are reviewed. The lesion of the phagocytes having absorbed dust particles is an essential step in the genesis of dust fibrosis. The cytotoxicity of inorganic dust is usually linked with the presence of chemically active centers on the particle surface, while the fibrogenicity of quartz dusts is due to the presence of mostly free silanol groups on the hydrated surface. The cytotoxicity and fibrogenicity roughly correlate with the negative charge of the surface. The fibrogenicity of dusts, while increasing with the free silica content, is modified by inorganic and organic impurities, and previous physical, chemical, and mechanical effects. The fibrogenicity increases with the reduction of the particle size to a certain limit, while it does not correlate with the rate of the pulmonary retention. The maximum allowable concentration of dust in workplace atmosphere is set as a function of the free silica content regardless of the actual modification of quartz present, on the basis of extensive epidemiological surveys and animal tests. While quartz dust alone is not carcinogenic, the increased cancer lethality in dust-exposed, smoking males compared with non-exposed females is indicative of the cocarcinogenicity of quartz relative to smoking.

46090 APTIC NO. [illegible]

Lamperti, Albert A. and Richard H. Printz

EFFECTS OF MERCURY VAPOR ON THE REPRODUCTIVE SYSTEM OF THE FEMALE GOLDEN HAMSTER. *Louisville Univ., Speed Scientific School, Ky.; International Assoc. for Pollution Control; American Chemical Society, Washington, D. C.; American Inst. of Chemical Engineers, New York; American Inst. of Industrial Engineers, New York; American Society of Civil Engineers, New York; American Society of Mechanical Engineers, New York; American Water Works Assoc., New York; Inst. of Electrical and Electronic Engineers, New York; and Water Pollution Control Assoc., Environ. Eng. Sci. Conf., Annu. Meet., Louisville, Ky., 1974, p. 513-521. 20 refs. (March 4-5.)*

The effects of mercury vapor on the reproductive cycle of the female hamster were studied. The hamster was used as the experimental animal because it has characteristic ovarian histology on each day of the 4-day cycle and because any change of hormonal activity is reflected in a change of ovarian morphology. Mature female golden hamsters were kept in an environmental chamber and exposed to mercury vapors of 1 or 6 mg/cu m concentrations for 10 or 24 hr/day for 8 days. Control animals were placed in a chamber without mercury exposure. The experimental period for all animals began on day 1 of a reproductive cycle. At the end of day 1 of the third cycle, the animals were checked for postovulatory vaginal discharges, sacrificed, and their reproductive organs removed and examined. Experimental animals in all groups had postovulatory discharges, fresh corpora lutea, and normal ovarian weights when compared to control animals; pituitary and uterine weights of all animals exposed to mercury vapor were significantly higher than those of control animals. Adrenal weights in both groups of vapor- exposed animals were significantly higher than control values. Animals exposed to 6 mg/24 hr of mercury exhibited signs of hyperexcitability and tremors when removed from the chamber at the end of the experimental period. There were no morphological differences discernible by light microscopy in the brains of all vapor-exposed animals.

46091 APTIC NO. [illegible]

Lauweryns, Joseph M. and J. H. Baert

THE ROLE OF THE PULMONARY LYMPHATICS IN THE DEFENSES OF THE DISTAL LUNG: MORPHOLOGICAL AND EXPERIMENTAL STUDIES OF THE TRANSPORT MECHANISMS OF INTRATRACHEALLY INSTILLATED PARTICLES. *Ann. N. Y. Acad. Sci., vol. 21:244-275, 1974. 154 refs.*

The function of the lung lymphatics in the defense mechanisms of the distal lung are discussed including the microscopic anatomy of the distal lung lymphatics and the ultrastructural features of lung lymphatics. An experimental study of the transport mechanisms of intratracheally instillated ferritin and carbon particles is described. Fifteen neonatal rabbits received 0.05 cc tracer substance by instillation. Carbon was administered as a colloidal solution of particles with a fairly homogeneous diameter in a solution of fish glue with a preservative. In eight other animals, a solution of ferritin was intratracheally instilled. In the alveolar lumen, ferritin particles mixed much more easily with the surfactant material than carbon particles. Both were phagocytized by alveolar macrophages and neutrophils. Tracer particles reached the interstitial tissue compartment by a transcellular route only. In type I alveolar epithelial cells, a vesicular type of transport seemed to occur with both types of particle. Fairly large numbers of ferritin molecules were phagocytized and digested in secondary lysosomes. The type II alveolar epithelial cells also phagocytized both tracers, suggesting the cells served the functions of secretion and phagocytosis. Cells of debatable origin in the connective tissue also contained phagocytized particles. The tracers were very rapidly present within the lymphatic lumina. Lymphatic endothelial cells also phagocytized ferritin particles in large vacuoles and secondary lysosomes. Ferritin particles occurred in micropinocytotic vesicles and coated vesicles. The findings at the level of the blood capillaries were qualitatively similar to those of the lymphatic endothelial cells, but quantitatively much less pronounced and only applicable regarding ferritin. Many particles were retained within the larger airways to be removed by ciliary activity. The bronchiolar nonciliated cylindrical or so-called Clara cells were also capable of phagocytizing ferritin molecules. (Author summary modified)

46092 **APTIC NO. 68731**

Lee, S. D., R. M. Danner, L. McMillan, W. Moore, Jr., and J. F. Stara

RADIORESPIROMETRY: RAPID TOXICOLOGICAL SCREENING OF ENVIRONMENTAL POLLUTANTS. *Preprint, Environmental Protection Agency, Cincinnati, Ohio Environmental Toxicology Research Lab., 4p., Oct. 11, 1974. 22 refs.*

A radiorespirometry method for the rapid toxicological screening of environmental pollutants is described along with some preliminary findings involving the exposure of laboratory animals to various concentrations of sulfur dioxide and methylmercury chloride. The technique is used to measure expired radiocarbon-labeled carbon dioxide is a biological system metabolizing radiocarbon-labeled compounds. Information obtained by the continuous measurement of rate and magnitude of labeled- carbon dioxide from specifically labeled substrates is contributing to the understanding of various pathways glucose metabolism and other metabolic processes. Once a respiratory pattern of a given labeled compound is established in an animal system, a variation in this pattern can indicate a change of the physiological or biochemical state of the animal. Experiments using both carbon-labeled glucose and palmitate in connection with sulfur dioxide exposure indicate an effect similar to the Pasteur effect, i.e., an inhibition of glycolysis which in turn causes an increased activity of lipid metabolism. Experiments with intragastric administration of methylmercury chloride at concentrations as low as 0.05 and 0.1 mg/kg indicate changes in the normal pattern of glucose catabolism.

46093 **APTIC NO. 69087**

LeRoy, Andre F.

INTERACTIONS OF PLATINUM-METALS AND THEIR COMPLEXES IN BIOLOGICAL SYSTEMS. *Preprint, National Inst. of Health, Research Triangle Park, N. C., National Inst. of Environmental Health Sciences and Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Development, 24p., 1974. 41 refs. (Presented at the Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Durham, N. C., April 16-19, 1974.)*

Platinum oxidation catalysts are to be introduced in exhaust systems of 1975 model-year automobiles in the U. S. to meet Clean Air Act standards. Small quantities of finely divided catalyst have been emitted by prototype systems; platinum and palladium compounds may also be emitted. Although platinum exhibits a remarkable resistance to oxidation and chemical attack, it reacts chemically under some conditions to produce coordination complex compounds. Palladium reacts more readily than platinum. Some platinum-metal complexes interact with biological systems as bacteriostatic, bactericidal, viricidal, and immunosuppressive agents. Workers chronically exposed to platinum complexes often develop asthma-like respiratory distress and skin reactions called platinosis. Platinum complexes used alone and in combination therapy with other drugs have recently emerged as effective agents in cancer chemotherapy. Understanding toxic and favorable interactions of metal species with living organisms requires basic information on quantities and chemical characteristics of complexes at trace concentrations in biological materials. Some basic chemical kinetic and thermodynamic data are presented to characterize the chemical behavior of the complex cis-(PT(NH3)Cl2) (cis-dichlorodiaminoplatinum(II)) used therapeutically. A brief discussion is given of quantitation of platinum at nanogram levels in biological tissue.

46094 **APTIC NO. 68584**

Lyublina, Y. I. and M. I. Mikheev

SCIENTIFIC PRINCIPLES FOR DETERMINING APPROXIMATE SAFE LEVELS OF ACTION OF CHEMICAL SUBSTANCES ON MAN. *(Nauchnyye osnovy ustanovleniya orientirovochnykh bezopasnykh urovney vozdeystviya veshchestv na cheloveka). Text in Russian. Zh. Vses. Khim. Obshchestva, Im DI Mendeleeva, 19(2):142-146, 1974. 26 refs.*

The scientific principles for determining and predicting the approximate safe levels of action of organic and inorganic chemical substances on the human organism are reviewed. The possibility of determining the approximate safe level of action of chemical compounds is based on definite relationships between the chemical structure; physical, chemical, and physicochemical properties; and the biological activity of substances in homolog series. The relationships between the chemical structure and biological action are most numerous for the group of organic non-electrolytes. Correlations between the chemical and physical parameters and the toxicological parameters of volatile and non-volatile organic compounds have been established. The correlation between the physical parameters, such as the molecular weight and the MAC value was stronger for volatile than for non-volatile organic compounds. The correlation between the physical constants, such as the boiling point and molecular weight and the MAC value was found to be stronger for organic than for inorganic vapors. Correlation was found between the toxicity and the position in the periodic table and the electron structure of metals and their compounds. The reduction of the degree of the crystal lattice symmetry was associated with an increase in the toxicity.

46095 **APTIC NO. 69086**

Moore, W., D. Hysell, L. Hall, K. Campbell, and J. Stara

PRELIMINARY STUDIES ON THE TOXICITY AND METABOLISM OF PALLADIUM AND PLATINUM. *Preprint, National Inst. of Health, Research Triangle Park, N. C., National Inst. of Environmental Health Sciences and Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Development, 18p., 1974. 12 refs. (Presented at the Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Durham, N. C., April 16-19, 1974.)*

Preliminary data are given on the lethal dose 50 (LD50) of palladium chloride following different routes of exposure and on the LD50 of platinum chloride following intravenous exposure. The retention, tissue distribution, and excretion of palladium (103) and platinum(191) in rats was determined following oral, intravenous, intratracheal, and inhalation exposure. The highest retention for both Pd(103) and Pt(191) was obtained following intravenous dosing, and the lowest retention occurred after oral dosing. Following a single oral dose, almost all of the Pd(103) and Pt(191) was excreted in the feces due to nonabsorption, whereas after intravenous dosing, similar quantities were excreted in both the urine and feces. Tissues containing the highest concentrations of these metals were the kidney, spleen, and liver. Following intravenous dosing of pregnant rats, a small amount of Pd(103) and Pt(191) was found in the fetuses. (Author abstract)

46096 **APTIC NO. 68520**

Sakurai, S., F. Tsunoda, S. Ishikawa, S. Nakaya, and Y. Suzuki

STUDIES ON AIR POLLUTION BY FLUORIDE. PART XII: THE NORMAL VALUE OF FLUORIDE CONCENTRATION IN SERUM. *(Fukkabutsu ni yoru taiki osen ni kansuru kenkyu (dai 12 ho) kesseichu fusso nodo no tsujochi ni tsuite). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 21(10:323, Oct. 1974. (Presented at the Japanese Society of Public Health Annual Meeting, 33rd, Fukushima, Japan, Oct. 16-18, 1974, Paper 437.)*

The fluorine concentration in serum was studied as an index for biological load of fluorides. Trace concentrations of fluorine in the sera of the population in a non-polluted area appeared in 55% of the men and 77% of the women; 99% of the values were less than 0.02 ppm fluorine. The frequency of people with more than 0.05 ppm of fluorine was a little higher in the mountainous parts of the non-polluted area. There were no cases of persons with a serum fluorine concentration of more than 0.05 ppm near the aluminum refinery in a polluted area which had an aerial fluorine concentration of around 1 ppb; however, 25% of the rural persons near the refinery showed serum fluorine concentrations of more than 0.05 ppm.

46097 **APTIC NO. 68508**

Shimizu, T. and E. Sato

GENERAL MEDICAL CARE FOR THE CHRONIC RESPIRATORY PATIENTS AT THE JOHOKU HOSPITAL, ISHIKAWA PREFECTURE: REPORT I: FOCUSING ON THE AGED. *(To-in (Johoku byoin) de no mansei kokyuki shikkan no sogoteki kanri: Dai-dai-po: rojin ni shoton o awasete). Text in Japanese. Preprint, All-Japan Democratic Medical Union, p. 40, 1974. All Japan Democratic Medical Union, Scientific Meeting 2nd, Sendai, Japan, Oct. 26-27, 1974.*

The chronic respiratory patients registered at Johoku Hospital in the last 4 years consisted of 202 pulmonary tuberculosis cases, 400 bronchial asthma cases, and 154 other chronic respiratory diseases sufferers. The ratio of patients over 60 years old was calculated, and the characteristic problems of the treatment were analyzed and discussed with regard to the following items: statistics of tuberculosis patient by age group and type of disease; case studies on terminal tuberculosis; statistics of bronchial astham patients by age group, intradermal test results; case studies on terminal bronchial asthma; treatment of emphysema; statistics of lung cancer; rehabilitation of the chronic respiratory patient; total care for the chronic respiratory patient; and activities of patient meetings.

46098 **APTIC NO. 68717**

Takahashi, Gonya

DISTRIBUTION AND METABOLISM OF BENZO(A)PYRENE IN FETAL MOUSE. *Bull. Chest Dis. Res. Inst. Kyoto Univ., 7(2):155-160, March 1974. 15 refs.*

The distribution of benzo(a)pyrene (BP) given intervenously into a pregnant mouse was observed by macroautoradiography. A small amount of BP was transferred into the fetus. The highest concentration was in the intestinal tract, followed by the liver and kidneys in the fetus near term. Concentrations in the lung were low in spite of the fact it is the most susceptible organ in transplacental carcinogenesis. Intact BP and its metabolites were detected in the fetal tissues during various developmental stages using radiometric analysis. Hydroxyl compounds were metabolized into conjugated materials and excreted through the intestinal tract of the fetus near term. (Author summary modified)

46099 **APTIC NO. 68760**

Ter Haar, Gary and Regine Aronow

THE USE OF TRACER TECHNIQUES AND ENVIRONMENTAL SOURCES FOR EVALUATION OF THE LEAD PROBLEM IN CHILDREN. *Preprint, Ethyl Corp. Research Labs., Detroit, Mich. and Children s Hospital of Michigan, Detroit, Mich., 11p., 1974 (?). 12 refs.*

A two part study was conducted to determine whether lead emitted from motor vehicles contributes to the lead problem observed in small children living in deteriorated urban areas. Lead in the soil around houses in urban areas and rural areas was analyzed. The concentration and distribution of lead around city and rural houses were nearly identical, with highest concentrations being found near the houses. Thus the principal cause of elevated lead in the soil appeared to be leaded paint on the houses. The second part of the study determined whether children ingest measurable amounts of air-suspended particulates or dustfall, using a naturally occurring tracer, lead-210, which is present in relatively large amounts in dust but nearly absent from paint. Urinalysis results showed that children with pica and other evidence of high lead intake excreted amounts of lead-210 identical to those excreted by normal children. Examination of the ratio of lead-210 to stable lead in the feces and possible lead sources indicated the source of lead was paint. Consequently, dust and air-suspended particulate were not shown to be sources of lead in the urban children. (Author summary modified)

46100 **APTIC NO. 68785**

Terracini, Benedetto, Enrico Anglesio, Alberto P. M. Cappa, Sergio Coverlizza, Mario Panero, and Guido Pastore

HIGH INCIDENCE OF LARYNGEAL CANCER IN THE PROVINCE OF TORINO (ITALY). *(Studio sull alta incidenza dei tumori maligni della laringe nella provincia di torino). Text in Italian. Tumori, 60(2):143-156, March-April, 1974. 7 refs.*

Histological reports and death certificates of 875 cases of laryngeal cancer in the province of Torino, Italy during the period 1965-1969 indicated that the province is a high risk area for laryngeal cancer. The relative frequency of laryngeal cancer to all malignant tumors recorded for the province at the Cancer Registry of Piedmont during the study period was 5.78% in the city of Torino, 6.43% in the suburbs, and 4.77% in the nonmetropolitan part of the province. Relative frequencies of laryngeal cancer in other cancer registries were under 2.86%, with the exception of Israel (3.24%) and Bombay (9.26%). The relative frequency of laryngeal cancer in women from different areas of the province of Torino fluctuated between 0.25 and 0.32% and were of the same order as those observed in other cancer registries, with the exception of Bombay (2.07%). Age standardized annual incidences per 100,000 cases of laryngeal cancer in the province of Torino considered as a whole were 12.6 for men and 0.6 for women. Comparison between the province of Torino and other cancer registries on age specific incidences showed that the ratio of the province of Torino to other registries was relatively higher at the age interval 35-44 years as compared to later years; this was considered as evidence of an increase in the environmental carcinogenic load for the province of Torino during recent years. On the other hand, laryngeal cancer truncated to ages 35-64 in the nonmetropolitan part of the province was 7.2 times higher than for rural populations of Norway and 2.1-4.1 times higher than for cancer registries in Great Britain, suggesting that factors connected with urban life, such as air pollution, are a minor cause of the laryngeal cancer excess in Torino.

EFFECTS-HUMAN HEALTH

46101 **APTIC NO. 68583**

Tiunov, L. A. and V. V. Kustov

COMBINED BIOLOGICAL ACTION OF CHEMICAL COMPOUNDS AND PHYSICAL FACTORS OF THE ENVIRONMENT. *(Kombinirovannoye biologicheskoye deystviye khimicheskikh soyedineniy, khimicheskikh i fizicheskikh faktorov vneshney sredy). Text in Russian. Zh. Vses. Khim. Obshchestva, Im DI Mendeleeva, 19(2):164-169, 1974. 84 refs.*

Studies on the combined action of chemical compounds and physical factors of the environment on the organism are reviewed. Summation, potentiation, antagonism, or independent action may occur during the simultaneous action of different toxic and irritating substances, including air pollutants. The simultaneous presence in the atmosphere of nitrogen dioxide, ozone, and unsaturated hydrocarbons results in the formation of highly irritative peroxides, epoxides, and aldehydes, while NO2 forms practically harmless ammonium nitrate with ammonia. Extraneous substances present in the organism may increase or decrease the toxicity of other extraneous substances by inhibiting or activating enzymes responsible for the metabolism of the latter. Carbon monoxide and carbon tetrachloride inhibit the microsomal enzymes. Accelerated development of poisoning, and increased susceptibility of the organism to toxic substances were observed at high temperatures. High humidity increases the irritative effect of nitrogen oxides and hydrogen sulfide and the toxicity of fluorine compounds and certain petroleum products while alleviating the course of poisoning by gasoline. The effect of CO and carbon tetrachloride is intensified by strong muscular stress. The development of hypoxia due to CO, carbon tetrachloride, benzene, and gasoline is facilitated by reduced barometric pressure. Loud noise intensifies the effect of CO, boric acid aerosol, and cracking gas, while vibration potentiated the effect of fluorine, lead, cobalt dust, and quartz dust. Hypoxia-inducing substances, such as CO and sodium nitrite antagonize ionizing radiation.

46102 **APTIC NO. 68620**

Toft, D. O. and T. C. Spelsberg

BINDING OF CHEMICAL CARCINOGENS IN THE LUNG. *J. Nat. Cancer Inst., 52(4):1351-1354, April 1974. 12 refs.*

The binding of the chemical carcinogen 3-methylcholanthrene (MCA) was examined in the cytosol fraction from tissues of the rat. With sucrose gradient centrifugation, macromolecular complexes of tritium-labeled MCA (3H-MCA) were observed in several tissues. A unique binding component was identified in the lung cytosol; other tissues produced a 4S component believed to be at least partially a result of contamination by serum proteins. The lung-binding component had a sedimentation coefficient of about 7S under low ionic conditions. It was altered to a 5S form in the presence of 0.3 M potassium chloride, which suggested a subunit composition. The lung component was not found in other tissues tested (serum, liver heart, kidney, testes, and uterus). These findings were verified by the in vivo administration of 3H-MCA. Although the carcinogen was readily taken up by several tissues, only the lung contained a complex sedimenting in the 7S region of sucrose gradients. Binding specificity has not yet been described, but one other chemical carcinogen, dibenz(a,h)anthracene, was also bound by the lung component. Possibly the 7S binding component represents a receptive site for the action of chemical carcinogens in the tissue. On the other hand, it may be that many polycyclic hydrocarbons from the atmosphere, including noncarcinogenic forms, gain access to this binding component, since the lung is an organ exposed to the external environment. Therefore, the biologic significance of this binding component may lie in its ability to control the fate of several types of air pollutants. (Author abstract modified)

46103 **APTIC NO. 68513**

Vinogradov, G. I., I. A. Chernichenko, and Y. M. Makarenko

ALLERGENIC ACTIVITY OF THE MOTOR TRAFFIC EXHAUST GAS. *(Ob allergennoy aktivnosti vykhlophnykh gazov avtptransporta). Text in Russian. Gigiena i Sanit., no. 8:10-13, 1974. 8 refs.*

The allergenic activity of certain components of automotive exhaust (carbon monoxide, formaldehyde, n-nonane, n-hexane, n-heptane, and n-decane) was studied in guinea pigs. The animals were exposed to formaldehyde concentrations of 0.38, 0.038, and 0.011 mg/cu m; to CO concentrations of 30, 4.64, and 1.67 mg/cu m; to 0.2 mg n-nonane, 0.01 mg n-hexane and n-heptane, and 0.0025 mg decane per cu m for 21 days 8 hr daily. While CO exhibited no allergenic activity, formaldehyde at the level of the maximum one-time and maximum allowable daily concentrations (0.38 and 0.038 mg/cu m) provoked allergic reaction, manifesting itself in alteration of the neutrophils, degranulation and lysis of basophils, and antipulmonary antibody formation. Possible sensitization of the organism associated with neutrophil alterations and agglutination capability of the thrombocytes due to the saturated hydrocarbons, and especially to n-nonane and n-decane, was observed.

46104 **APTIC NO. 68519**

Wakisaka, I.

RESPIRATION SUPPRESSING ACTION BY SULFITES AEROSOL. *(Aryusan eazoru ni yoru kokyu yokusei sayo). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 21(10):322, Oct. 1974. (Presented at the Japanese Society of Public Health Annual Meeting, 33rd, Fukushima, Japan, Oct. 16-18, 1974. Paper 463.)*

Inhibition of respiration occurs when sulfur dioxide gas is inhaled. Hydrosulfites give the same pattern of respiration inhibition as SO2 when inhaled as an aerosol, but inhalation of sulfites does not give a similar pattern. When a sulfite is inhaled with SO2, only the pattern for SO2 inhibition is shown. It is the hydrosulfite ion which causes the irritation because it exists in an acidic state and on the slightly alkaline mucosa of the nasal cavity changes to sulfite ion and chemical changes cause irritation. Oxidation to the original protein results in the disappearance of irritation immediately after stopping the inhalation. The change of mucosa in the nasal cavity to slightly acidic to inhibit the reaction of forming the sulfite ion from the hydrosulfite ion desensitizes the reaction.

46105 **APTIC NO. 69081**

Yoakum, Anna M., Peggy L. Stewart, and Janice E. Sterrett

METHOD DEVELOPMENT AND SUBSEQUENT SURVEY ANALYSIS OF BIOLOGICAL TISSUES FOR PLATINUM, LEAD AND MANGANESE CONTENT. *Preprint, National Inst. of Health, Research Triangle Park, N. C., National Inst. of Environmental Health Sciences and Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Development, 51p., 1974. 15 refs. (Presented at the Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Durham, N. C., April 16-19, 1974.)*

An emission spectrochemical method is described for the determination of trace quantities of platinum, lead, and manganese in biological tissues. Total energy burns in an argon-oxygen atmosphere are employed. Sample preparation, conditions of analysis, and preparation of standards are discussed. The precision of the method is consistently better than + or - 15%, and comparative analyses indicate comparable accuracies. Data obtained for experimental rat tissues and for selected autopsy tissues are presented. (Author abstract)

46106 **APTIC NO. 68469**

Kyoto Municipal Government (Japan), Dept. of Environmental Pollution Control

THE EFFECT OF AIR POLLUTION ON CHILDREN S HEALTH. *(Jido no kenko ni oyobosu taiki osen no* *eikyo). In: Kyoto-shi Kogai Ekigaku Kenkyu Hokoku. (The Epidemiological Research Report on Environmental Pollution in Kyoto City), p. 1-12, March 1974.*

The entire first and second grade from 153 schools of Kyoto (36,789 children) were given a questionnaire and their mothers were asked to answer on the asthmatic symptoms of the children wheezing, coughing, sputum, breathing difficulty, and asthmatic history. The investigation was conducted in November 1970, and the recovery rate was 97%. The sulfur oxide levels and the nitrogen oxide levels were measured by alkaline filter at each of the 153 schools, and the correlation between the morbidity of the asthma-like symptoms of the children and the level of pollution were examined. The total morbidity for asthmatic symptoms including light cases was about 6%. This rate is about 40% of the morbidity of children in the highly polluted area of Kitakyushu. The ratio between the maximum and the mimimum morbidity rate in the 14 districts of the city was 1.5:1; in the case of light symptoms only, the ratio was 2:1. The morbidity for light asthmatic symptoms showed a significant correlation between air pollution degrees by district. Heavy symptoms morbidity did not show a correlation with the degree of air pollution.

46107 **APTIC NO. 68551**

Illinois Inst. for Environmental Quality, Chicago, Ill., Environmental Health Resource Center

HEALTH EFFECTS AND RECOMMENDATIONS FOR AIR-BORNE FLUORIDES (FINAL REPORT). *Proj. 10.006, Rept. IIEQ 74-23, 65p., June 1973. 99 refs.*

NTIS: PB 233845

Airborne fluorides are injurious to corn, sorghum, tomatoes, soybeans, gladioli, and a variety of other plants. The human health effects of exposure to excessive concentrations of airborne fluorides include acute effects such as severe eye and nose irritation and skin injury, and chronic effects such as osteosclerosis. Based on these two considerations, phytotoxicity and human toxicity, the Environmental Health Resource Center supports a standard for airborne fluorides of 0.7 micrograms/cu m based on a 24-hour average. This standard applies to airborne fluorides in both gaseous and particulate forms and is based on one atmosphere of pressure and 25 C. The chronic and acute effects of fluorides upon which this recommendation is based are reviewed. (Author abstract modified)

46108 **APTIC NO. 68607**

Illinois Inst. for Environmental Quality, Chicago, Environmental Health Resource Center

HYDROGEN SULFIDE HEALTH EFFECTS AND RECOMMENDED AIR QUALITY STANDARD (FINAL REPORT). *Proj. 10.006, Rept. IIEQ 74-24, 33p., March 1974. 59 refs.*

Hydrogen sulfide is a colorless poisonous gas which causes eye and respiratory tract irritation, and can damage the nervous system. Its natural occurrence, man-made sources, atmospheric episodes, health effects (acute, subacute, and chronic), pharmacology, properties, and standards are discussed. Because of the known adverse health effects and the intermittent presence of this gas in Illinois communities, a standard of 0.015 mg/cu m (0.01 ppm) is recommended, based on an 8-hour average sample. (Author abstract modified)

46109 **APTIC NO. 69139**

National Academy of Sciences, National Academy of Engineering, Washington, D. C., Coordinating Committee on Air Quality Standards

AIR QUALITY AND AUTOMOBILE EMISSION CONTROL. VOLUME 2: HEALTH EFFECTS OF AIR POLLUTANTS. *93rd Congress (Senate), 2nd session, serial 93-24, 518p., Sept. 1974. 577 refs. (Prepared for the Committee on Public Works.)*

The health effects of carbon monoxide, nitrogen oxides, photochemical oxidants, ozone, airborne particles, and sulfur oxides are reviewed. Among the topics are the physiology and chemistry of CO effects; CO uptake from urban air and additive effects of cigarette smoking and exposure to ambient CO on carboxyhemoglobin; relation between CO and coronary disease; CO and behavior; effects of CO during exercise; effects of CO on the developing embryo, fetus, and newborn infant; population especially susceptible to CO exposure; toxicological effects of nitrogen dioxide alone in experimental animals; effects of combined exposures to NO2 and other agents in experimental animals; toxicologic effects of other NOx in experimental animals; effects of nitrogen in man; effects of combined exposures to NO2 and other agents in man; animals experiments on effects of SOx; dose-response relations of SOx exposures; task force on synergism and antagonism of pollutants in producing health effects; and task force on the effects of air pollution on ecologic systems.

1973

46110 **APTIC NO. 69667**

Alessio, R.

NOTES ON ATMOSPHERIC POLLUTION AND RESPIRATORY DISEASES IN MILAN DURING THE WINTERS OF 1969-1970-1971. *(Inquinamento atmosferico ed affezioni respiratorie. Osservazioni su una indagine svolta a Milano nel periodo invernale 1969-1971). Text in Italian. Med. Soc., 23(5):187-198, Sept.-Oct. 1973. 34 refs.*

Studies on the effects of air pollution on the respiratory tract are reviewed, and an epidemiological survey conducted in Milan, Italy, during the winters of 1969, 1970, and 1971 on 5708 hospitalized patients is presented. In this patient material, bronchopneumopathy accounted for 28%. Significant correlation between the respiratory morbidity and the increased air pollution levels, especially the sulfur dioxide and dust concentrations, was established. The reduction of the ambient temperature was accompanied by an increase in the SO2 and dust concentrations, and indirectly by a reduction in the rate of recovery of the patients. Studies on the effects of air pollution on the respiratory tract revealed irritation of the respiratory mucosa, bronchial spasms, edema, granulocyte infiltration and sometimes hemorrhage of the bronchial mucosa, hypersecretion, inversion of the direction of fibrillation of the ciliary epithelium, and aggravation of preexisting respiratory affections by SO2. Nitrogen oxides, ozone, and automotive exhaust increased the susceptibility of rats to Klebisella pneumoniae.

46111 **APTIC NO. 69156**

Bonashevskaja, T. I.

AMYGDALOID LESIONS AFTER EXPOSURE TO FORMALDEHYDE. *(Izmeneniya amigdalyarnogo komplekca pri vozdeystvii formal delidom). Text in Russian. Arkh. Anatom., Gistol. I Embriol., 65(12):56-59, 1973. 7 refs.*

The effect of formaldehyde inhalation on the amydaloid complex of albino rat brain was investigated neurohistologically and histochemically. Day-long inhalations of formaldehyde in concentrations of 0.012, 0.035, 1, and 3 mg/cu m were carried out with 75 animals during a 3-month period. Concentrations of 1 and 3 mg/cu m of formaldehyde resulted in changes in the neurons and receptor synaptic amygdaloid complex. A proliferative reaction of the perineural glia was also observed at this concentration. Changes in muscle (antagonist) chronaxia paralleled to the above histological changes. Blood cholinesterase activity was decreased at formaldehyde concentrations of 3 mg/cu m.

46112 **APTIC NO. 68561**

Bouley, G.

EFFECTS OF ATMOSPHERIC POLLUTANTS ON HEALTH. *(Les effets de quelques polluants atmospheriques sur la sante). Text in French. Econ. Med. Anim., 14(2):97-100, 1973.*

The effect of carbon monoxide, acrolein, and automobile exhaust gas on rats and mice was studied. Experiments were conducted 1 mo periods ranging from 1 month to the duration of the animals life. The animals exposed to a CO concentration of 50 cu cm/cu m air showed no departure from the control regarding such factors as reproduction, body weight, food intake, duration of life, activity, ECG, organ weight, body fluids, enzyme activity, resistance, and carcinogenesis. Significant growth retardation and reduction of the redox coenzyme level in the liver were observed in animals exposed to 1 or 0.5 cu cm acrolein/cu m air. Exhaust gas diluted at a rate of 1:20 with an artificially maintained CO concentration of 50 cu cm/cu m caused reduction of the alveolar macrophage count, i.e., local immune depression, and growth retardation, while in 1:1000 dilution with the same CO content it had no detectable effect.

46113 **APTIC NO. 68778**

Dingeon, B. and C. Collombel

AIR POLLUTION FROM LEAD ADDED TO GASOLINE. *(Incidence du plomb ajoute a l essence dans la pollution atmospherique). Text in French. Lyon Pharm., 24(4):539-544, 1973. 30 refs.*

General hygienic and toxicological problems of lead added to gasoline are discussed. Lead emitted by motor vehicles pollutes the air especially in cities and along highways, and is accumulated by soil and plants. The lead levels found in the blood of subjects living in cities and near highways was significantly higher than in rural dwellers. Close correlation between the atmospheric lead concentration and the carbon monoxide concentration as well as the traffic density was established, which is indicative of traffic being the source of atmospheric lead. The effect of traffic on the atmospheric lead concentration extended over a distance of up to 4 km. The lead, emitted by motor vehicles in the form of submicron particles, is retained in the organism at rates of 5-10% following ingestion, and at rates of 30-50% when inhaled. Lead is partially excreted by the liver, kidney, hair, and nails. Some 95% of the retained lead is found in the blood, and accumulation in the bones with potential mobilization due to increases in the corticosteroid level was observed. Exposure to lead can be diagnosed by basophil granulation test, urine delta-aminolevulinic acid test, and delta-aminolevulinic acid dehydratase test.

46114 **APTIC NO. 69136**

Eaton, W. C., Carl M. Shy, John F. Finklea, James N. Howard, Robert M. Burton, George H. Ward, and Ferris B. Benson

EXPOSURE TO INDOOR NITROGEN DIOXIDE FROM GAS STOVES. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Human Studies Lab., 13p., Jan. 1973. 11 refs.*

The effect of indoor exposure to nitrogen dioxide from gas stoves was assessed by a prospective survey of acute respiratory disease among middle-class families living in a suburban fringe community where ambient pollutant exposure was low. The families were queried at 2-week intervals from October 1970 through May 1971 concerning common respiratory ailments. A total of 146 participating families were grouped according to natural gas cooking families (59.6%) and those not using gas cooking (40.4%). These groups were similar with respect to distribution of cigarette smokers, and percent of families who changed address during the previous 5 yr. Illness experience of the two groups was compared for four family segments (mothers, fathers, schoolchildren, and preschoolchildren). All family segments, with the exception of pre-schoolchildren, in homes using natural gas cooking reported significantly more acute lower respiratory illness. Indoor monitoring studies in one home for 7 days showed maximum NO2 concentrations at the stove of 0.40-1.0 ppm during cooking as opposed to zero levels prior to cooking. The highest value occurred when the oven and three surface burners were used for about 75 min (hood-type exhaust operating). Indoor NO2 exposures were related to gas flow rate, duration of burning, and distance from the stove.

46115 **APTIC NO. 68762**

Goldman, Marvin

COMPARISON SCALES FOR RADIOACTIVE AND NON-RADIOACTIVE HAZARDS. *In: Annual Report - Fiscal Year 1973. California Univ., Davis, Radiobiology Lab., Atomic Energy Commission Contract AT(04-3)472, AEC Research and Development Rept. UC-48, p. 8-15, June 1973. 11 refs. (Presented at the American Medical Association, Congress on Environmental Health, Chicago, Ill., April 29-30, 1973.)*

NTIS: UCD 472-120

Assessment of health hazards associated with energy production demands a balance between engineering source terms, to describe and quantitate effluents and emissions, and biomedical predictions. Nuclear power stations are required to keep radiation emissions as low as practicable (less than 10 mrem/yr); in actuality, they will probably contribute about 0.1% or less of the total annual radiation dose. A linear dose-effect proportionality is prudently assumed, and radiation risks to population groups are scaled in units such as excess expectation of health effects/10 to the 6th power people/yr/unit dose (rem). Data suggest that a several thousandfold safety factor may exist. For nonnuclear pollutants, a risk analogous to a man-rem concept does not yet exist. Safety standards for alternate energy sources lack the dose-effect quantification needed to extrapolation of health effects/watt/person/yr. Examples of risk estimates for current and future energy sources are presented with suggestions for health cost assessments and evalulations. The concept of low-level exposures is discussed. briefly using sulfur dioxide as as example. (Author abstract modified)

46116 **APTIC NO. 68798**

Jouan, M.

HEALTH ASPECTS OF AUTOMOTIVE POLLUTANTS. *(Aspects sanitaires des polluants de l automobile). Text in French. Rev. Ass. Fr. Tech. Petrole), no. 221:90-95, Sept.-Oct. 1973. 9 refs.*

General health aspects of carbon monoxide, lead, nitrogen oxides, unburned hydrocarbons, and aldehydes are described. Unlike spark ignition engines, diesel engines emit but minimal quantities of carbon monoxide. Automotive carbon monoxide may cause chronic poisoning by its combination with hemoglobin. The threshold value beyond which physiological changes occur lies at 2.5% carboxyhemoglobin. Nitric oxide, and especially nitrogen dioxide cause pulmonary edema, impaired respiratory function, and chronic bronchitis in very low concentrations. According to regulations implemented in France, a CO concentration of 40 ppm/hr must occur not more than 1% of the time on a yearly basis. A level of 15 ppm must not be exceeded fo/ more than 15% of the time in any 9-hour period. The maximum allowable 1-hour nitrogen oxide concentration is set at 0.25 ppm. The emission standards implemented, as well as favorable meteorological conditions have resulted in an abatement of the CO concentrations in Paris.

46117 **APTIC NO. 68804**

Juhasz, Jeno

ACHIEVEMENTS AND OUTLOOKS IN THE STUDY OF ENVIRONMENTALLY CONDITIONED AND OCCUPATIONAL CANCER. *(A kornyezeti es foglakozasi rak kerdesenek mai allasa: eredmenyek es kilatasok). Text in Hungarian. Orv. Hetil., 114(22):1275-1281, June 3, 1973. 22 refs.*

A status report is presented on research on environmentally conditioned and occupational cancer. Some 70 to 90% of all malignant tumors are due to exogeneous factors that can be chemical, physical, or biological (viral) in their nature. Extensive studies revealed practically no relation between the chemical structure and nature and the carcinogenic effect of chemical substances. According to a classification of chemical carcinogens with respect to the site of their action, certain carcinogens, such as arsenic, asbestos, nickel, chromium, and tar act on the site of their contact with the organism, while other carcinogens, such as aromatic amines, act in the site of their excretion. Benzene, thorium, and azo dyes cause tumors in the site of their storage and accumulation in the organism. Another group of carcinogens exerts its effect in the site of its specific affinity. Summation of subthreshold doses of different chemical carcinogens was observed. Minimum, effective, no-effect, and maximum levels of carcinogens were established. Spontaneous synthesis of 3,4-benzo(a)pyrene, a natural growth stimulator, was determined in plants. Polycylic aromatic hydrocarbons such as 3,4-benzo(a)pyrene generated in combustion processes in domestic heating and by motor vehicles as well as asbestos and beryllium around industrial plants are regarded as the principal carcinogenic air pollutants responsible for both environmental and occupational tumors. The incidence of lung cancer and mesothelioma in occupational asbestosis was in a range of 22-71%. Potentiation of the carcinogenic action of asbestos by other industrial pollutants, such as coal tar, ammonia, isobutyl oil, and chromates was determined in a chemical plant.

46118 **APTIC NO. 68323**

Kaufman, David G., Valerio M. Genta, Curtis C. Harris,
Joseph M. Smith, Michael B. Sporn, and Umberto Saffiotti

BINDING OF 3H-LABELED BENZO(A)PYRENE TO DNA IN HAMSTER TRACHEAL EPITHELIAL CELLS. *Cancer Res., vol. 33:2837-2841, Nov. 1973. 31 refs.*

Isolated tracheas were incubated in vitro in the presence of tritiated benzo(a)pyrene. Highly purified DNA was isolated from the epithelial cells of these tracheas. It contained bound tritiated benzo(a)pyrene. If tracheas were obtained from hamsters previously treated intratracheally with benzo(a)pyrene plus ferric oxide, this binding was enhanced. Incubation of tracheas in the presence of 7,8-benzoflavone or at a temperature of 0 degrees resulted in inhibition of this enhanced binding. The tracheal epithelium is able to metabolize benzo(a)pyrene and this metabolism is necessary for the inducible binding of benzo(a)pyrene to DNA in this tissue. (Author summary)

46119 **APTIC NO. 69127**

Opletal, A., E. Cerny, and A. Mozna

THE EFFECT OF PASSIVE SMOKING ON THE AIRWAYS MUCOSA TESTED IN ANIMAL EXPERIMENTS. *(Vliv passivniho koureni na sliznici dychacich cest v experimentu). Text in Czech. Cesk. Otolaryngol., 22(1):33-37, Feb. 1973. 9 refs.*

The effect of cigarette smoke on the airways mucosa of guinea pigs was examined in long-term trials using a special smoke inhalation chamber. Only minor superficial inflammatory lesions were found in the bronchi and hyperplastic lymphoid tissue of 18 animals whose laryngeal and lower airways mucosa were studied histologically. Histochemical investigation of the tracheal mucosa in five animals disclosed inversion of nonspecific esterase activity.

46120 **APTIC NO. 68467**

Petrzela, Karel, Valja Styblova, Jiri Pechan, Jan Janech, and
Kvetoslov Hosek

STUDIES OF THE HEALTH STATUS IN WORKERS IN ENVIRONMENT WITH FREQUENT INCIDENCE OF HIGHER CONCENTRATIONS OF CARBON MONOXIDE IN THE ATMOSPHERE. *(Sledovani zdravotniho stavu pracujicisch s castejsim vyskytem zvysenycn koncentraci kyslicniku uhelnateho ve vzduchu). Text in Czech. Pracovni Lekar (Prague), 25(6):229-234, June 1973. 14 refs.*

Medical examinations were performed on 52 workers who were chronically exposed to carbon monoxide concentrations of up to 0.4 vol% over a long period of time. Increased carboxyhemoglobin levels persisted for 24 hr after work stoppage. Comparisons between the CO-exposed group and a control group of 47 metallurgists disclosed more frequent abnormal neurologic (electroencephalograms) manifestations in the exposed group, even after excluding individuals suffering from acute CO intoxication. Prolonged psychomotor reaction to light and sound stimuli was also observed in exposed individuals. The possibility of clinical changes resulting from chronic CO exposures exceeding 0.01 vol% is indicated.

46121 **APTIC NO. 68567**

Rondia, D

THE EFFECT OF AIR AND WATER POLLUTANTS ON HUMAN HEALTH. *(Effet des polluants de l air et de l eau sur la sante humaine). Text in French. J. Pharm. Belg., 28(5):605-627, 1973.*

The two basic approaches in the study of the influence of air and water pollutants on human health are reviewed. The first one is an experimental or toxicological approach, concerned with biochemical, physiological, and clinical lesions, with the mechanism of the genesis of such lesions, and with the possible relations between the toxic dose and the extent or degree of the lesions. Thus, considerable changes in the electrolyte and trace element concentrations in the organism were observed following short-term exposure to such air pollutants as ozone, nitrogen dioxide cause emphysema in a short time. Rather stable equilibrium between the uptake and excretion of lead was established. The increase in the blood lead level is accompanied by a decrease in the aminolevulinic acid dehydratase activity, a change believed to have no functional consequence. The other, epidemiological, approach is based on the study of human populations actually exposed to pollutants in daily life. Such epidemiological studies are complicated by the large number of extraneous variables playing a significant role in such discrete effects. Epidemiological studies are concerned with the establishment of relationships between specific or nonspecific mortality and morbidity associated with the actual pollution level as compared with control areas and control populations. A qualitative relationship between the increasing pollution level and advanced date of death was determined for populations with respiratory and cardiovascular diseases. A relationship was found between the high pollution level and the number of patients hospitalized during a high-pollution in Los Angeles.

46122 **APTIC NO. 68651**

Sorber, Charles A.

PROTECTION OF THE PUBLIC HEALTH. *Environmental Protection Agency, Region II and Rutgers-The State Univ., N. J., Coll. of Agricultural and Environmental Science, Land Disposal Munic. Effluents Sludges, Proc., New Brunswick, N. J., 1973, EPA- 92/9-73-001, p. 201-209. 4 refs. (March 12-13.)*

The formation, inhalation, and dangers of biological aerosols emitted by spray irrigation of wastewater are discussed. Aerosols are particles in the size range of .01 to 50 micron which are suspended in air. Spray irrigation of chlorinated effluent produces biological aerosols in the same order of magnitude as observed from nonchlorinated wastewater applied to trickling filters. If significant numbers of organisms are present in the effluent, the probability of inhaling pathogenic aerosols near a spray irrigation site would be significant. Bacterial aerosols remain viable and travel further with increased wind velocity, increased relative humidity, lower temperatures, and darkness. Pathogenic microorganisms may survive longer in sewage aerosols and in soil than common indicator organisms such as coliform organisms. Approximately 82% of the 1 micron particles; 28% of the 0.1 to 0.3 micron particles; and 51% of the 0.03 particles are deposited in the alveoli. If disinfection of sewage is not complete and the pathogenic organisms are aerosolized, even very low number of these organisms may be a potential health hazard. The evaluation of the survival, distribution, and hazard of aerosolized pathogenic microorganisms disbursed by spray irrigation machinery is recommended.

46123 **APTIC NO. 64894**

Tsukamoto, Yuso and Sachiko Serizawa

AIR POLLUTION AND INFANT COLD SYMPTOMS: WITH A SUGGESTION TO ENVIRONMENTAL STANDARDS. *(Taiki osen to kodomo no kaze shojo - kankyo kijun eno teian o fukume). Text in Japanese. Preprint, 4p., 1973. (Presented at the Japanese Society of Child Health, Study Meeting on Air Pollution and Infant Health, 20th, Tokushima, Japan, Oct. 26-27, 1973.)*

The cold symptoms of 150 infants and children up to the age of 3 at 15 day nurseries in Osaka Prefecture had been observed every day from November 1972 to June 1973. The number of hours per month in which the 1-hour values of nitrogen oxides and sulfur dioxide at the Osaka Prefectural Pollution Monitoring Center exceeded 0.1 ppm were compared with the monthly morbidity of infant cold symptoms. In November 1972, nitrogen oxides and sulfur dioxide exceeded 0.1 ppm for 67 hours and 25 hours, respectively, and the rate was 36.2% for infants and 48.9% for children. Subsequent observations in December 1972 and January and February 1973 also showed a close relationship between air quality and cold morbidity. In observations at two nurseries in Osaka and Sakai, the weekly average values of nitrogen oxides were 0.069 ppm and 0.034 ppm, respectively, the weekly average rates were 62% and 68%, respectively, and the correlation coefficient was 0.68. The case in Osaka can be nearly explained by nitrogen oxides concentration alone and the case in Sakai by sulfur dioxide concentration alone; therefore, the national environmental sulfur dioxide standard for the 24-hour average value of 0.04 ppm is improper.

46124 **APTIC NO. 68412**

Ministry of the Environment (Ontario) and Ministry of Health (Ontario)

AIR POLLUTION AND HUMAN HEALTH. *Preprint, 24p., March 1973. 6 refs.*

The human health effects of air pollution and air quality objectives are discussed. Factors that must be considered in establishing safe levels either for occupationally exposed workers or for the general population include permissible intake, concentration of pollutants, and the dose. The relationship between air quality objectives and the threshold limit value of pollutants is not constant; the safety factor depends upon individual pollutants and mixtures of pollutants. Common detrimental health effects include damage to the lungs and other parts of the respiratory system, acute intoxication by inhalation of poisonous substances; chronic intoxication; allergic reaction to materials in the air; irritation of eye, nose, throat, or skin; cancer; nuisance effects, and nose damage. Specific effects of individual pollutants are presented for carbon monoxide, hydrocarbons, nitrogen oxides, particulate, sulfur dioxide, and trace elements.

46125 **APTIC NO. 68577**

Vanderbilt Univ., Nashville, Tenn.

ASSESSMENT OF HUMAN EXPOSURE TO ENVIRONMENTAL MERCURY AND OTHER MINERALS (FINAL REPORT). *National Science Foundation Grant GI-35348, Rept. NSF/RA/E-73-005, 64p., Aug. 22, 1973. 3 refs.*

NTIS: PB 227 549

Concentrations of mercury, lead, cadmium, selenium, rubidium, zinc, iron, and cobalt were determined in placenta, material blood, and fetal blood from over 1000 births, in Nashville, Tenn. The levels of Hg were determined in human breast milk, and in maternal and fetal hair. A positive corelation was obtained between the levels of Hg, Se, Rb, and CO in placenta, maternal blood, and fetal blood. Fluctuations in the elemental levels from one placenta to another was small. Animal studies indicate the concentration of Hg in the infant at birth can be determined by measuring the Hg levels in placenta or infant hair. The placenta acts as a monitor in two ways: by measuring the trace element content of placenta from a subset of births in a given location over a period of time, changes in the average environmental exposure to humans can be established, and the placenta can monitor possible correlations between abnormal trace element levels and various congenital defects of postnatal illnesses.

1972

46126 **APTIC NO. 68763**

Dorogokuplya, A. G., L. K. Adilgireyeva, and A. I. Myasnikov

THE INFLUENCE OF AIR POLLUTANTS ON THE ORGANS OF WHITE RATS WITH VITAMIN A DEFICIENCY. *(Vliyaniye zagryaznennogo dymom vozdukha na organizm belykh krys pri A-gipovitaminoze). Text in Russian. Izv. Akad. Nauk Kaz. SSR, Ser. Biol., no. 3:57-60, 1972. 2 refs.*

The chronic effect of inhaled 3,4-benzopyrene-containing smoke on albino rats with vitamin A deficiency was studied in a 90-day experiment. No morphological and pathological changes were detected during the first 30 days of the experiment, while both pathological changes and 3,4-benzopyrene were observed in the lung, liver, esophagus, and stomach on the 60th day. Interstitial pneumonia, bronchopneumonia, proliferation of the pulmonary epithelium, and adenoma; hepatitis with focal necroses, fatty degeneration of the liver, and proliferation of Kupffer s cells; ulcerative esophagitis and papilloma; and planocellular non-keratosic carcinoma in the esophagus were found. Gastritis with epithelial proliferation was found by the 90th day of the experiment. The 3,4-benzopyrene levels found in the lung, liver, esophagus, and stomach on the 60th day were 0.009, 0.02, 0.05, and 0.006 gamma/g, which increased to 0.014, 0.039, 0.014, and 0.33 gamma/g by the 90th day, respectively. The vitamin A deficiency greatly accelerated the general pathological and carcinogenic process.

46127 **APTIC NO. 68612**

Matolo, Nathaniel M., Melville R. Klauber, William M. Gorishek, and John A. Dixon

HIGH INCIDENCE OF GASTRIC CARCINOMA IN A COAL MINING REGION. *Cancer, 29(3):733-737, March 1972. 13 refs.*

Carbon and Emery Counties contain the only coal mining regions in Utah. The age- and sex-adjusted incidence of gastric cancer in these two counties is four times that of the State of Utah. A detailed study of patients with stomach cancer in the coal mining region revealed that 59% of the male patients in Carbon and Emery Counties were coal miners. The gastric cancer incidence in coal miners was at least three times that of noncoal miners living in counties with coal mining and at least eight times that of males in counties with no coal mining. The increased risk for females in these two counties was not statistically significant, but the increased risk in males was highly significant compared to other Utah males. All homes of patients afflicted with gastric cancer in both Carbon and Emery Counties were heated with coal, and, in some of the homes, coal was used for cooking. Thus, coal mining in the area might be the etiologic factor, and to a lesser degree, the use of coal for heating and cooking. The extensive use of coal for heating is the major source of soot pollution. Coal soot has a high benzopyrene content, and benzopyrene is a carcinogen. If some of the particles were inhaled and then swallowed, gastric carcinoma could be induced by benzopyrene and its related carcinogens. (Author abstract modified)

46128 **APTIC NO. 68515**

Osaka Municipal Government, Bureau of Environmental Health Medical Association of Osaka Prefecture, Japan

THE INVESTIGATION OF THE RATE OF EXAMINATION RECIPIENT FOR SPECIFIC RESPIRATORY DISEASES. *(Tokutei kokyuki shikkan jushin-ritsu chosa). Text in Japanese. 42p., Oct. 1972.*

Investigations of special respiratory diseases and air pollution as a cause were conducted by collecting diagnostic data from eight districts of Osaka and analyzing them by computer. As respiratory diseases and diagnostic standards, the Fletcher definition for chronic bronchitis, the American Thoracic Society definitions for bronchial asthma and emphysema, and the Japan Environmental Agency standard for asthmatic bronchitis were used. The average morbidity ratio for eight districts was 0.36% of the population. The highest was 0.49% in the Konohana district, followed by 0.46% in Tennoji, and 0.45% in the Minato district. The average number of patients per medical center was 4.6; the highest was 7.4 in the Minato district, and 3.2 in Tennoji. These diseases cannot be judged simply as results of air pollution, but from the standpoint of influences on the young, asthmatic bronchitis can be used as an index of air pollution. The morbidity of children was generally extremely high, even in areas where air pollution was considered relatively low. Generally the effects of air pollution on human health are changing from the former localized pattern to a large-area phenomenon.

1971

46129 **APTIC NO. 68374**

Hamm, J.

CLINICAL ASPECTS OF LUNG DISEASES DUE TO AIR POLLUTION. *(Das klassische Bild der Lungenerkrankung durch Luftverunreinigungen). Text in German. Praxis Pneumol., 25(8):453-465, 1971. 26 refs.*

The clinical picture, diagnosis, therapy, and prognosis of chronic bronchitis and chronic obstructive lung diseases in general are surveyed with respect to the role played by air pollution in the genesis of such diseases. Studies available so far do not allow any positive relationship between occupational chronic exposure to dust, as in miners, and the development of chronic bronchitis and emphysema to be established. It is even more difficult to ascertain the chronic effect of polluted air on the lung function due to the intervention of various climatic factors, such as humidity, low temperature, fog, and epidemics. Sulfur dioxide, dust, cold air, and increased humidity of the air can induce functional troubles in the lungs of susceptible subjects. The morbidity due to asthma, bronchitis, and emphysema was slightly higher in industrial areas than it was in rural areas in Germany. Chronic bronchitis and chronic obstructive lung disease carry an unfavorable prognosis despite intense therapy, and therefore the development of bronchitic conditions should be prevented by eliminating as far as possible the occupational and non- occupational exposure to irritating dust, gases, and vapors. Knowledge of the causal role of air pollution in the development of nonspecific lung diseases is still very incomplete.

46130 **APTIC NO. 68539**

Marcotte, Francis

AIR POLLUTION AND RESPIRATORY AFFECTIONS. EXPERIMENTAL STUDY OF CERTAIN BIOLOGICAL EFFECTS OF AIR POLLUTANTS. *(Pollution atmospherique et affections respiratoires. Etude experimentale de certains effets biologiques des microconstituants de l atmosphere). Text in French. Claude-Bernard Univ., Lyon (France), Thesis (M.S.), Lyon, Oct. 27, 1971, 128p. 283 refs.*

Studies on air pollution are reviewed, and the effect of particulate pollutants on mice were studied. The different sources of air pollutants, the influence of the meteorological conditions on the mode of transport and behavior of pollutants in the tracheobronchial tract as a function of particle size and the individual respiratory physiology, and epidemiological surveys indicative of relationships between respiratory symptoms and air pollution are surveyed. An isolated inhalable atmospheric dust fraction was introduced into newborn mice in the form of an aerosol, intranasally or subcutaneously, in doses corresponding to the quantity normally inhaled. The pathomorphological study of the tracheobronchial tract after 6 months revealed atelectatic lesions of the type of reticular pnuemonia in the vasculohistiocytic stage. No tumorous proliferation was evidenced in the test animals. In general, air pollution is one of the most important causes of certain pathological respiratory syndromes, such as asthma and bronchitis.

1970

46131 **APTIC NO. 68894**

Thiess, A. M. and F. G. Ferara

TOXICOLOGICAL INJURY PRODUCED BY IRRITANT GASES. *(Toxikologische Schaeden durch Reizgase). Fortschr. Med., 88(4):147-151, 1970. 14 refs. Translated from German. Leo Kanner Associates, Redwood City, Calif., 13p., March 1973.*

A toxicological survey of irritant gases used in the chemical industry is presented from 919 observations recorded over a period of 14 years. Ammonia, chlorine, hydrogen sulfide maleic anhydride, phthalic acid, phthalic anhydride, and the isocyanates are representative irritant gases which cause damage to the upper respiratory passages. Phosgene, ethylenimine, nitric acid, diemthyl sulfate, nickel carbonyl, and chloroformic esters affect the lower air passages, leading to the development of lung edema. Among the 919 cases of irritant-gas poisoning, 502 of them were caused by irritant gases acting primarily on the lower air passages, resulting in a total of five deaths. The damaging action of an irritant gas is a function of the water or lipoid solubility of the active substance, the concentration of the gas, and the length of exposure.

1967

46132 **APTIC NO. 68908**

Benini, F.

THE RISK OF CARBON MONOXIDE INTOXICATION IN PLATINUM CATALYSTS WORKERS. *(La manutenzione di catalizzatori al platino e il rischio di intossicazione da ossido di carbonio). Text in Italian. Lav. Um., 19(5):193-199, May 1967. 17 refs.*

A case of acute poisoning by carbon monoxide in a platinum catalyst worker in a petroleum processing plant is reported. The poisoning was due to entering the catalyst chamber during regeneration at which time the CO concentration amounted to 0.5% by volume. Coma, unconsciousness, mydriasis, hypethermia, anuria, cyanosis, moderate neutrophil leukocytosis, slight hyperazotemia, hyperglycemia, and carboxyhemoglobinemia were found on admission to the clinic. Headache, clonicotonic spasms, vertigo, tremors, and anuria occurred during recovery. Tremor of the hands, depression, and dyspepsia persisted for several months after clinical recovery.

1959

46133 **APTIC NO. 68812**

Savicevic, M., B. Milijic, and M. Stankovic

CHRONIC POISONING BY CARBON MONOXIDE. *(Contribution a l etude de l intoxication chronique par l oxyde de carbone). Text in French. Acta Med. Iugoslavica, 13(2):129-137, 1959.*

The subjective and objective manifestations of chronic occupational exposure to carbon monoxide were studied in 153 subjects. The subjective complaints were dominated by irritability with headache, asthenia, and vertigo, the occurrence of which was significantly higher than in a control group. Correlation between the occurrence of headache and asthenia and the blood CO level was established. Increased occurrence of dermographia, absence of synkinesis of the clenched fists, and frequent hypotension were observed in clinical examinations. Anemia was more frequent in the control group than in the test group.

1954

46134 **APTIC NO. 68329**

Beidler, Lloyd M.

PHYSIOLOGICAL PROBLEMS IN ODOR RESEARCH. *Ann. N. Y. Acad. Sci., 58(2):52-57, March 1954. 15 refs.*

The difficulties encountered in the study of the response of the olfactory receptors to odor stimulation hinder the sensory physiologist in his attempt to solve the physiological problems related to olfaction. There also appears to be a lack of interest in the sense of smell among biologists and other scientists. For these reasons the physiology of the sense of smell is relatively unexplored as compared to the senses of vision or audition. It is hoped that in the future there will arise enough interest and support in olfactory research so that more scientists will explore this virgin field. Some of the physiological problems of the olfactory process include the transmission of odors to receptors and properties of the olfactory receptors. Objective methods of study of these problems are reviewed. (Author conclusions modified)

EFFECTS-PLANTS AND LIVESTOCK

1974

46135 **APTIC NO. 68700**

Belot, Y. and D. Gauthier

MECHANISMS OF THE TRANSFER OF PARTICLES IN THE MICRON RANGE BETWEEN THE ATMOSPHERE AND PLANTS. *(Mecanismes de transfert des particules microniques entre l atmosphere et les plantes). Text in French. Bull. Inform. Sci. Tech. Commis. Energ. At. (Fr.), no. 191:67-73, April 1974. 7 refs.*

The mechanisms of the transfer of particles in the 1-10 micron size range were studied in a wind tunnel at wind speeds ranging from 1 to 20 m/sec, using monodisperse fluorescein sodium and methyl blue aerosol was test substance, and Pinus sylvestris and oak twigs as capture elements. The rates of capture measured on Pinus sulvestris twigs ranged from 0.005 cm/sec for 2 micron particles at s cm/sec wind speed to 50 cm/sec for 10 micron particles at 10 m/sec wind speed. For oak leaves which assumed horizontal positions at wind speeds over 1-2 m/sec, the rates of capture measured for a size range of 2-5 micron were by 10 to 20 times lower than for pine twigs. The proportion of the aerosol settled on the woody parts amounted to 10-20% of the total amount deposited. The rate of capture was generally much higher than the rate of sedimentation at wind speeds over 1 m/sec. The rate of capture increased very rapidly with the wind speed. The findings indicate that the rate of transfer of fine particles is highest for fibrous leaves or small-diameter twigs.

46136 **APTIC NO. 68560**

Berge, Helmut

VEGETATION AND AIR POLLUTION. *(Emissionen und Immissionen in der Land- und Forstwirtschaft). Text in German. PEP (Prod., Ertrag, Profit), no. 2:1-6, 1974. 10 refs.*

A general description is given of the effects of air pollutants on vegetation in agriculture, horticulture, sylviculture, and the significance of plants and especially of forests in air pollution abatement is discussed. Smoke damages to plants can be determined quantitatively or qualitatively and examined progressively. Exposure to hydrochloric acid in the air caused chloroplast damages in Picea pungens, and inactivation of the pesticide Duphar by alkaline loess settling on rose leaves was observed. Serious damage to plants due to city gas in the air or in the soil due to leaking pipes was found. Plant damages due to ammonia emissions from a pig farm were determined. Vegetation, especially trees in green belts and in mediam strips of highways are valuable in that they produce oxygen and filter out particulate air pollutants.

46137 **APTIC NO. 66358**

Doorn, Wouter G., van

BIOELECTRIC RESPONSE AND PHOTORESPONSE CHANGES AFTER SUBLETHAL APPLICATIONS OF SULFUR DIOXIDE TO ZINNIA ELEGANS. *Preprint, Iowa State Univ. of Science and Technology, Ames, Dept. of Horticulture, 54p., 1974. 39 refs.*

Laboratory experiments investigated bioelectric response potential (BEP) and photoresponse changes in Zinnia elegans var. (Canary Yellow leaf) to sudden, sublethal sulfur dioxide exposures, using the slope and amplitude of the first waveform trough as a criterion for SO2 action. Polyethylene-lined test enclosures equipped with fluorescent lamps, fiberglass electrode supports, and an exterior black cloth for dark tests were utilized as whole-plant SO2 exposure chambers to allow for the monitoring of both initial and subsequent SO2-induced plant BEP changes and photoresponses; this was in contrast to BEP experiments with Zinnia elegans by other investigators where plants were first fumigated with SO2 and then lab-tested sequentially for BEP response, resulting in uneven test-time lapses and a lack of BEP response data during actual fumigation. Low-impedance, non-polarizable, non-phytotoxic silver/silver chloride electrodes were placed in 2 cm long polyethylene plastic tubes filled with a 2% (by weight) agar plus 0.1 N potassium chloride solution in aquadest and were connected to a Grass polygraph, with the strip chart speeded up to 1 cm/sec for more-detailed readout. Amplitude sensitivity settings of either 5 or 2 mV/cm were used, and the electrode placement with respect to the upper and lower leaf sides was offset by 2 cm. Sublethal SO2 injection under constant light conditions caused a BEP oscillation similar to that resulting from a light-off response but with a definitely lowered initial stationary BEP level for SO2 concentrations of 7-100 ppm. Light-on and light-off plant photoresponses were also changed following SO2 application. Measurement of BEP was not an indication of either stomatal opening or thermocouple- detected temperature differences between upper and lower leaf sides. The method offers promise as an indicator for sublethal SO2 action on plants under field conditions since it utilizes relatively simple equipment, does not destroy the plant, and results in a reproducible and characteristic response for SO2.

46138 **APTIC NO. 64794**

Gilbert, O. L.

AN AIR POLLUTION SURVEY BY SCHOOL CHILDREN. *Environ. Pollut., 6(3):175-180, April 1974. 6 refs.*

A criticism of biological scales for the estimation of air pollution has been that they can only be used by experts. A highly simplified scale was developed and used by schoolchildren (average age 13-14 years) to produce a picture of air pollution for Great Britain, including Scotland, which compares favorably with existing lichen zone maps. The survey used a booklet containing background information on clean and polluted air and an apparatus for carrying out some simple experiments. Since lichens show a wide range of sensitivity to sulfur dioxide, they are found in zones as a result of changes in the level of this pollutant. The children observed the growth of lichens on deciduous trees, acid stone, and alkaline stone to determine seven lichen zones corresponding to different levels of SO2 pollution. (Author abstract modified)

46139 **APTIC NO. 68973**

Hayakawa, Kazuya and Takeshi Kubo

FUNDAMENTAL STUDIES OF AIR POLLUTION EFFECTS ON ENVIRONMENTAL CAPACITY. (1) PLANT VITALITY AS AN ENVIRONMENTAL INDEX. *(Taiki osen no kankyo yoryo ni kansuru kisoteki kenkyu. (Sono 1) Kankyo shihyo to shite no shokubutsu katsuryoku). Text in Japanese. Preprint, Japan Society of Architecture, Tokyo, p. 169-170, 1974. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4085.)*

Correlations between plant health and environmental pollution were investigated in the Tokyo area. Seven types of trees (deciduous and evergreen) were selected in 19 locations, such as parks, where trees grow in abundance. Vitality of five to 10 trees of each type at each location was checked with respect to 12 items of observation, rated from 1 (good) to 4 (bad). When the ratings were plotted on a map of the Tokyo area, lowering of arboreal vitality was discernable along a more or less north-south line, worsening in an easterly direction. This distribution agrees for the most part with the atmospheric pollution concentration distribution of metropolitan Tokyo, and indicates the feasibility of using plant indicators to measure the environmental index of atmospheric pollution.

46140 **APTIC NO. 68701**

Legouet, F., J. Delmas, and A. Grauby

EXPERIMENTAL METHOD FOR THE STUDY OF THE EFFECTS OF AIR POLLUTANTS ON PLANTS. *(Methode experimentale d etude des effets de la pollution atmospherique sur les cultures). Text in French. Bull. Inform. Sci. Tech. Commis. Energ. At. (Fr.), no. 191:75-80, April 1974. 8 refs.*

An experimental setup for the study of the individual and synergistic effects of sulfur dioxide, nitric oxide, nitrogen dioxide, carbon monoxide, and carbon dioxide on plants is described. Different plant species were exposed to controlled pollutant concentrations; 100 to 1000 micrograms/cu m in the case of SO2 in a closed system of bells with controlled temperature, humidity, and light conditions. The rate of photosynthesis as a criterion of the effects of the air pollutants was measured.

46141 **APTIC NO. 68992**

Martin, W. and T. Keller

ON THE INFLUENCE OF POLLUTED CITY AIR ON THE VEGETATION. *(Ueber den Einfluss verunreinigter Stadtluft auf die Vegetation). Text in German. Umwelthygiene, 25(10):221-227, 1974. 40 refs.*

Ash trees and spruce were planted into styropor pots and setup on roof gardens throughout Zurich in early April 1972. It was hoped that metabolic changes due to the effect of air pollutants could be detected by determination of the peroxidase activity. For this, leaf and needle samples were taken on June 7 (8 1/2 wk after the initial exposure), July 3 (after 12 wk), July 24 (after 15 wk) and August 14 (after 18 wk). The samples were deep frozen and stored for the analysis. Peroxidase activity was determined by the colorimetric method described by Keller and Schwager. Peroxidase activity of the exposed ash trees increased markedly. It was highest in that part of the city with the highest air pollution. It is assumed that part of the city with the highest air pollution. It is assumed that the traffic exhaust gases, particularly ethylene and ozone, are responsible for the increased peroxidase activity. Nitrose gases, too, could be responsible.

46142 **APTIC NO. 68725**

Matsui, Koyo

ENVIRONMENTAL PROTECTION AND FOREST ADMINISTRATION. *(Kankyo hozen to shinrin shigyo). Text in Japanese. Shigen (Resources), no. 188:71-76, March 1974.*

With the recent increase of air pollution, West Germany reports that forests receive 20-25 kg/ha of nitrogen with rain precipitation and 100 kg/ha of sulfur dioxide. About the same amount of nitrogen precipitates in Japan in areas near cities. Ammonia nitrogen is absorbed into soil as nitrogen trioxide; part of it is absorbed by plants and becomes nourishment, and part of it flows into streams and rivers. However, while passing through the forest soil, the concentrations of nitrogen or phosphorus or sulfur dioxide decrease, the forest soil working as a kind of filter. Therefore, forests have a cleansing mechanism for air and water, helping soil conservation in addition to producing timber. As one of the health effects of forests they stabilize carbon dioxide and emit oxygen. But since their own respiration consumes O2 and emits CO2, the actual amount of O2 emission is the difference between the production and consumption. Old forests emit a relatively small amount of O2. The trees, in addition, have some cleansing effects for pollutants by accumulating them on leaves, acting as filters; however, this contribution is very limited and when the amount exceeds a certain level, the trees themselves will be harmed.

46143 **APTIC NO. 68719**

Ure, A. M. and C. A. Shand

THE DETERMINATION OF MERCURY IN SOILS AND RELATED MATERIALS BY COLD-VAPOUR ATOMIC ABSORPTION SPECTROMETRY. *Anal. Chim. Acta, 72(1):63-77, Sept. 1974. 48 refs.*

A method for the determination of mercury in soils and plant materials by cold-vapor atomic absorption spectrometry is described. The cold vapor atomic absorption technique differs from the usual bubbling technique in that the mercury in the sample solution is first partitioned between the liquid phase and a fixed volume of air by agitation before the latter is passed through the measuring cell since this method renders more reproducibility. Three preparative methods are developed, two of which use acid digestion and wet oxidation and the other direct oxidation in an oxygen-flask combustion technique. Excellent agreement obtained between the digestion method and the oxygen-flask combustion method for mercury contents from 0.09-0.26 micrograms/g indicates that these two radically different oxidation procedures are equally effective; agreement of these two methods with analyses by digestion, volatilization, and collection suggests that no significant matrix effects occur.

1973

46144 **APTIC NO. 68820**

Corte-Baeten, K. de and M. Debackere

LEAD-DETERMINATIONS IN HEALTHY AND INTOXICATED CATTLE AND IN HEALTHY PIGS. *(Onderzoek naar de loodgehalten bij gezonde en geintoxikeerde runderen en bij gezonde varkens). Text in Dutch. Vlaam. Diergeneesk. Tijdsch., 42(5):233-248, 1973. 20 refs.*

Lead concentrations in blood, liver, kidney, and hair were determined for healthy cattle, calves, and pigs. The mean values were, respectively, 0.4 + or - 0.2 ppm, 0.2 + or - 0.1 ppm, and 0.7 + or - 0.2 ppm for blood; 0.8 + or - 0.4 ppm, 0.5 + or - 0.2 ppm, and 0.9 + or - 0.4 ppm for liver; and 1.0 + or - 0.4 ppm, 0.6 + or - 0.3 ppm, and 0.9 + or - 0.4 ppm for kidney. In the hair, mean values of 6.7 + or - 2.9 ppm were detected for cattle and 5.5 + or - 2.0 ppm for pigs. The mean values for the different tissues examined were lower in calves than in adult cattle, and this difference was significant for the blood and kidney values. A significant correlation was found between the normal lead concentrations in the hair and those in the blood, liver, and kidneys in cattle. The values for blood and liver or kidney also showed a significant correlation. In pigs these correlations were not found. A very significant correlation was found between the normal lead values for liver and kidney in cattle and pigs. Lead concentrations were also determined in tissues or blood from presumably intoxicated cattle. Concentrations higher than two standard deviations above the normal mean were considered as the upper limit of normality. This means values of 0.8 ppm for blood, 1.6 ppm for liver, and 1.8 ppm for kidney tissue. Based upon these data, blood lead analysis seems to be a valuable ante mortem test for most of the cases encountered. Analysis for lead in the kidney was the most reliable post mortem test of those studied for the diagnosis of lead poisoning, even more reliable than the lead analysis in liver.

46145 **APTIC NO. 68355**

Costonis, A. C.

INJURY TO EASTERN WHITE PINE BY SULFUR DIOXIDE AND OZONE ALONE AND IN MIXTURES. *Eur. J. Forest Pathol., 3(1):50-55, 1973. 8 refs.*

Clones of eastern white pine trees selected for their sensitivity to sulfur dioxide were fumigated in a controlled environment chamber. Sulfur dioxide alone and in combination with ozone at concentrations of 5 pphm of air by volume of each gas for independent 2-hour exposures was toxic to new needles. The severest injury resulted from a discontinuous fumigation with 5 pphm O3 and 5 pphm SO2 for 2 hr in separate fumigations, followed 24 hr later by a 2-hour exposure to a mixture of these gases, each at 5 pphm. The rapidity of lesion development and total injury to new needles were less following a single 2-hour fumigation with an O3-SO2 mixture than when a single 2-hour fumigation with SO2 alone was used. Ozone and SO2 reacted to reduce injury. These plants were not injured by O3 used alone. New needles receiving only filtered air or new needles on resistant plants were not visibly affected by any treatment. Acute injury induced by the O3-SO2 mixture developed differently from injury induced by SO2 alone. (Author abstract)

46146 **APTIC NO. 69162**

Farrier, P. M. and D. R. Pullen

SURVEY OF FLUORIDE LEVELS IN THE AREA AROUND THE BLUFF SMELTER. *Proc. Pollut. Res. Conf., Wairakei, New Zealand, 1973, p. 341-356. 13 refs. (June 20-21.)*

The environmental control monitoring program at the Bluff Aluminum Smelter is discussed as applied to areas adjacent to the smelter. Fluorine effects on wildlife and vegetation are considered, and the background levels of fluorine in the flora, fauna, air, and water of the area are presented. The effect of smelter emissions on these background levels and the care needed when interpreting these results are also discussed. The results showed that extraneous sources of fluorine may influence the fluoride content of biological tissues and that allowance must be made for this factor in interpreting results against established standards. In particular, the effect of top-dressing with phosphate fertilizers was discovered. There was also a great variation in the fluoride levels in different species of flora and fauna. Emission of fluorides from the smelter had a small influence on the background levels in some areas, but in no instances were the standard limits to prevent damage to vegetation and livestock exceeded. No change was detected in the atmospheric fluoride levels in areas western and northern from the smelter since the smelter began operations. Levels on the eastern side (downwind) of the plant were greater, but standards are not expected to be exceeded. (Author conclusions modified)

1972

46147 **APTIC NO. 68782**

Ernst, Wilfried

ZINC AND CADMIUM POLLUTION OF SOILS AND PLANTS IN THE VICINITY OF A ZINC SMELTING PLANT. *(Zink- und Cadmium-Immissionen auf Booden und Pflanzen in der Umgebung einer Zinkhuette). Text in German. Ber. Deut. Bot. Ges., 85(7-9):295-300, 1972. 15 refs.*

The airborne zinc and cadmium pollution of soils and plants around a zinc smelting plant was studied. Accumulation of both zinc and cadmium in plants and soil by factors of up to 100 was determined. Exposure to zinc and cadmium-containing dust for 3 consecutive years resulted in the death of such plant species as Pinus silvestris L., Juniperus communis L., Acer platanoides L., Quercus robur L., Malus communis Mill., and in partial damage of Carpinus betulus, Tilia platyphyllos, Taxus baccata, Aesculus hippocastanum, and Betula alba. The rates of penetration of cadmium and zinc deposited on the leaves amounted to over 90% and 12.5-31%, respectively. Most of the cadmium and zinc were found in insoluble or soluble form in the cell wall which is indicative of a limited metabolic activity of these heavy metals. The zinc and cadmium levels were above the normal value in soils at distances of up to 3.5 km from the smeltery. Following cultivation in contaminated soil for 8 weeks, Silene cucubalus L. accumulated 4500 mg zinc and 32.7 ml cadmium per kg of dry matter. Zinc substantially reduced the dehydrogenase activity and the microbial nitrogen mineralization process in the soil.

46148 **APTIC NO. 68575**

Guderian, Robert

EFFECTS OF AIR POLLUTANTS ON PLANTS. *(Wirkungen von Luftverunreinigungen auf Pflanzen). Text in German. Umwelt, 1972:206-211, 1972.*

The effects of air pollutants on plants are described. Air pollutants, such as sulfur dioxide, hydrofluoric acid, hydrochloric acid, peroxyacetyl nitrate, and ozone may cause acute, chronic, and invisible or physiological damages to plants by deteriorating the growth, yield, and quality. The extent of the damage progresses with increasing pollutant concentration, rather than the length of exposure time. Both SO2 and HF interfere with photosynthesis, and the former metabolizes chlorophyll to pheophytin, while HF interferes with porphyrine synthesis. Both SO2 and HF deplete the water reserve of the plant organism. Inert dust is injurious in keeping light away from the leaves and clogging the stomatc, while toxic, water-soluble dust components act directly on the exposed parts. Air pollution reduces the resistance of plants to frost and pests. Due to their response to air pollutants, certain plants can be used as bioindicators of air pollution.

46149 **APTIC NO. 68347**

Kuehn, H. and N. Faller

SO2 IN THE ATMOSPHERE AND ITS ROLE IN SULPHUR NUTRITION OF PLANTS. *Proc. Int. Symp. Sulphur Agric., 1970, p. 265-273, 1972. 15 refs.*

The role of atmospheric sulfur dioxide in the sulfur nutrition of plants is reviewed. Observations in West Germany indicate that in spite of the relatively low amounts of sulfur brought into the soil by fertilization, and in spite of well known losses by leaching, crop sulfur supply is well assured to the release of huge amounts of gaseous sulfur dioxide as a result of the combustion of sulfur-containing fuels. The total annual sulfur dioxide emission in West Germany is about 4 million tons and is equivalent to an average of 240 kg of sulfate per hectare. Plant chamber experiments using labeled sulfur dioxide show increased yields for sunflower, maize, and tobacco at 0.2 mg of the gas; all of the plants display the uptake of sulfur dioxide from the air for production of dry matter. Plant sulfur uptake is an essential factor in the reduction of undesirable amounts of atmospheric sulfur dioxide.

46150 **APTIC NO. 68770**

Leibetseder, Josef, Monika Skalicky, Abdul Hakim Said, Alfred Kmont, Erich Glawischnig, and Gerd Schlerka

INVESTIGATIONS OF THE TOXIC EFFECTS OF HAY FROM SMOKE DAMAGED AREAS ON CATTLE. *(Untersuchungen ueber toxische Wirkungen von Heu aus Rauchschadensgebieten beim Rind). Text in German. Erzmetall., 25(10):498-505, Oct. 1972. 21 refs.*

The toxic effect of hay contaminated with lead, zinc, and fluorine, collected from smoke damaged areas around a lead and zinc smelter and another sulfuric acid production plant, on the physiological status of cows was studied by clinical observations and during a 6-month feeding test. The lead and zinc contents in the hay were above normal but below the toxic limit, while the fluorine level approached the upper limit of the normal range. Apart from lesions of the enamel of the incisors, detected in about one third of all exposed animals, no symptoms of poisoning were detected. The recurrent clinical examinations performed every two weeks for hematology, alkaline phosphatase, bilirubin, ornithine carbamoyltransferase, and glutamic-oxaloacetic transaminase-revealed no indications of poisoning. The lead and zinc concentrations in blood, plasma, urine, feces, milk, and hairs were below the toxic range, and the fluorine level in the bones ruled out fluorosis. At the same time, the per-capita milk production was significantly reduced by 0.64 l/day.

46151 **APTIC NO. 68574**

Warmbt, Wolfgang

DEPENDENCE OF THE SULFUR DIOXIDE CONCENTRATION OF METEOROLOGICAL INFLUENCES IN THE SMOKE-DAMAGED AREA OF ERZGEBIRGE. *(Die Abhaengigkeit der SO2-Konzentration on meteorologischen Einflussgroessen im Rauchschadengebiet des Erzgebirges). Text in German. Erfassung Auswirkungen Luftverunreinigungen, Vortr Lufthyg. Kolloq., 3rd, 1971, p. 167-184, 1972.*

Results of the long-term monitoring of the sulfur dioxide concentrations and meteorological parameters in the smoke-damaged coniferous forests of Erzgebirge in East Germany are presented. The SO2 concentrations were highest during anticyclonal conditions with winds from the Bohemian industrial basin. Such conditions occurred on about 90 days of the year. The SO2 concentrations measured during cyclonal periods with winds from the opposite direction were low. The evaluation of the number of days with anticyclonal conditions and winds from the Bohemian Basin and of the days with SO2 stress led to the same result. To considerable growth depression in the 1961-1964 period was due only partly to the above-average percentage of periods with SO2 influence.

1966

46152 **APTIC NO. 68542**

Domroes, Manfred

AIR POLLUTION AND URBAN CLIMATE IN THE RHINE-WESTPHALIAN INDUSTRIAL AREA AND THEIR INFLUENCE ON LICHEN GROWTH ON TREES. *(Luftverunreinigung und Stadtklima im Rheinisch-Westfaelischen Industriegebiet und inhre Auswirkung auf den Flechtenbewuchs der Baeume). Text in German. Arb. Rheinischen Landeskunde, no. 23:1-133, 1966. 252 refs.*

Lichens on tree boles were examined on 25,114 trees along streets and areas in the central part of the Ruhr District and related to air pollution concentrations. The lichens were studied with regard to physiognomy, density, and exposition, and in relation to bark characteristics of tree species. Lichens were classified into the following areas: Lichen desert, transitional zone, or area of normal distribution. The lichens were sensitive to air pollution, especially sulfur dioxide emissions. The damaging influence of the town climate, especially aridity, was taken into consideration. Lichens were missing in all areas with a high degree of air pollution. These were areas of high density housing and of lower humidity than open country. Areas which had lower housing density and lower humidity also had increased lichen damage. Lichens missing in the immediate neighborhood of factories or industrial areas outside towns. Lichen growth was reduced along busy roads.

1965

46153 **APTIC NO. 68394**

James, H. A.

SURVEY OF ARSENIC AND FLUORINE LEVELS IN VEGETATION IN THE RODEO-CROCKETT AREAS - 1963 - 1964. *Preprint, Bay Area Air Pollution Control District, San Francisco, Calif., 11p., April 1965. 2 refs.*

Arsenic and fluoride levels in vegetation of the San Francisco Bay area (Rodeo-Crockett areas of Contra Costa County) were determined over the period September 1963 to August 1964 to determine if various industrial sources, particularly a brickworks facility and a lead smelting operation, were contributing to previously observed plant damage. Twelve monthly vegetation samples were taken at six sites in the area; lime-paper strip samples were taken at the same sites plus one additional location. Fluoride in excess of the safe level for beef cattle (50 ppm soluble fluoride) was found in five of 71 pasture grass samples taken during the survey; elevated arsenic levels coincided with the high fluoride levels in the same samples. Grass sample results were generally in agreement with lime paper data for fluoride and arsenic. Seasonal wind data, visual evidence of plant damage and the analytical findings suggested that the major contributing source, both for fluorides and arsenic, was in the Selby area.

1937

46154 **APTIC NO. 68792**

Hofmann, P.

POISONING OF ANIMALS BY INDUSTRIAL FUMES. *(Die Gefaehrdung der Tierwelt durch Industriegase). Text in German. Archiv Gewerbepathol. Gewerbehyg., no. 7:670-671, 1937.*

Autopsy findings on game that died presumably due to poisoning by arsenic are presented. Corrosive gastroenteritis with edema and ecchymosis of the mucosa, and partly ulceration of the stomach, and fatty degeneration of the kidneys and liver were found in hares and stags. Arsenic was detected in the gastric content, liver, and other organs. These cases were diagnosed as acute to subacute poisoning by arsenic. Catarrhal gastrointestinal mucosa, pseudomembranes in the esophagus, inflammatory edema of the nasal septum and laryngeal mucosa, and sometimes liver cirrhosis and edema of the spleen were found in red deers, roes, and hares. In these cases, poisoning by arsenic could not be identified as the primary cause of death. The symptoms of the poisoning were similar to those observed in game around a smelter prior to the installation of an efficient arsenic trap.

46155 **APTIC NO. 68799**

Prell, H.

DAMAGES TO ANIMALS DUE TO THE REMOTE EFFECT OF INDUSTRIAL WASTE GASES. *(Die Schaedigung der Tierwelt durch die Fernwirkungen von Industrieabgasen). Text in German. Arch. Gewerbepathol. Gewerbehyg., no. 7:656-670, 1937.*

Diseases and deaths of game in the Tharandt Woods, Germany, and their possible causes were studied. Frequent and massive deaths of bees, as well as alopecia, extreme cachexia, paresis, modifications of the antlers, black coloration of the skin, and death of game, especially of red deer, deer, stag, and hares were observed. Ulceration of the stomach and intestines, and cirrhosis or enlargement of the liver and spleen were determined in game. Liver, gastric content, and hair samples contained arsenic. The poisoning was due to a smelter emitting particulate arsenic compounds which deposit in an area with a radius of up to 20 km, depending on the meteorological conditions. Similar poisoning symptoms were also found in cattle and horses in the same area, as well as in game from another arsenic-polluted area. Water bodies in the polluted area were unsuitable for fish production. Arsenic was detected in fish caught in one of the fishponds.

EFFECTS-MATERIALS

1975

46156 **APTIC NO. 69124**

Spence, J., F. Haynie, and J. Upham

EFFECTS OF GASEOUS POLLUTANTS ON PAINTS: A CHAMBER STUDY. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, 24p., Jan. 6, 1975. 5 refs.*

Panels with oil-based house paint, acrylic latex house paint, vinyl coil coating, and acrylic coil coating were exposed in chambers to simultaneously controlled temperature, relative humidity, and concentrations of sulfur dioxide, nitrogen dioxide, and ozone for periods of 250-1000 hr to statistically assess the direct and synergistic effects of the pollutants on erosion surface rate. Oil-based house paint experienced the highest erosion rate (60 micron/yr), whereas vinyl and acrylic coil coatings showed very low erosion rates (3.3 micron/yr and 0.6 micron/yr, respectively). Erosion rates were invalid for latex house paint because sulfur dioxide reacted with the aluminum substrate. Sulfur dioxide concentration was a significant factor with respect to the erosion rate of oil base house paints. A multiple linear regression of sulfur dioxide concentration and relative humidity accounted for 61% of the variability. Simple regression of temperature and humidity for clean air data accounted for 89% of the variability. Approximately34% of the variability in a simple linear regression for vinyl coil coating erosion rate data was accounted for by sulfur dioxide and relative humidity. The linear regression equation indicated that at the primary standard of 80 micrograms/cu m sulfur dioxide contributes less than 5% to the erosion rate. Ozone was the only pollutant that had a significant effect on the erosion rate of the acrylic coil coating. Neither relative humidity nor temperature had significant effects on the coating s erosion rate under clean air exposure conditions.

1974

46157 **APTIC NO. 62183**

Honma, Katsunori and Tadao Watabe

ANALYSIS OF COMPOSITION OF EACH AEROSOL PARTICLE. *(Earozoru ryushi koko no sosei bunseki). Text in Japanese. Preprint, Japan Society for Industrial Hygiene, Tokyo, p. 294-295, 1974. (Presented at the Japan Society for Industrial Hygiene, 47th, Nagoya, Japan, March 29-31, 1974, Paper 403.)*

With the combined use of a scanning-type electron microscope and a non-dispersive X-ray diffractometer using a semi-conductor element for detecting X-rays, the analysis of the elemental composition of each aerosol particle in a microscopic region of 500 to 1000 is possible. The elemental composition of air pollutant particles which can damage the thin iron film, obtained by a microscopic non-dispersive X-ray analyzing method and a thin metal film method, are reported. The test samples used were aerosols collected from the air of the seaside industrial areas, central business areas, and outlying areas of Kawasaki City during a photochemical smog episode. Aerosol particles collected on a day when a typical photochemical smog occurred had a chemical composition injurious to the iron film; however, there were particles which did not damage the film at all. Analyses of both types of particles by microscopic non-dispersive X-ray analyzer showed that the element which damaged the film the most was predominately sulfur, and the nondestructive element was chlorine.

46158 **APTIC NO. 69135**

Spence, J. W. and F. H. Haynie

PITTING OF GALVANIZED STEEL IN CONTROLLED CLEAN AIR ENVIRONMENTS. *Preprint, American Society for Testing and Materials, Philadelphia, Pa., 22p., 1974. 14 refs. (Presented at the American Society for Testing and Materials, Materials Engineering Congress, Detroit, Mich., Oct. 21-24, 1974.)*

Panels of 18-gauge galvanized steel with a zinc coating of 25 micron were exposed to clean air and polluted air (containing sulfur dioxide, nitrogen dioxide, and ozone) in controlled environmental chambers which simulated diurnal conditions to investigate the effect of the different environments on metal corrosion processes. Weight loss and film thickness loss were estimated after exposure periods of 250, 500, and 1000 hr. Corrosion of the zinc film was essentially a linear function of time for each of the environmental exposure conditions. Corrosion rates for polluted exposure ranged from 3.18 micron/yr to 33.27 micron/yr, while clean air corrosion rates were similar, ranging from 1.14 micron/yr to 37.17 micron/yr. Uniform corrosion of the zinc occurred in the polluted exposures, whereas pitting corrosion of the zinc was observed in the clean air exposures. Scanning electron microscopy/ microprobe analysis of the galvanized zinc surface revealed that pitting corrosion products localized and formed a barrier that accentuated an acidic condition with the pit. Pitting corrosion was then accelerated by the difference in pH within and outside the pit. Pitting corrosion was prevented during the pollutant exposures because drastic pH differences about the inclusions did not occur.

46159 **APTIC NO. 68530**

Salvin, V. S.

COLORFASTNESS TO ATMOSPHERIC CONTAMINANTS. PART TWO. *Text. Chem. Color., 6(8):41-45, Aug. 1974. 22 refs.*

The colorfastness of dyes to ozone is reviewed and the AATCC procedures for evaluating susceptibility to O3 are discussed. The fading of dyes by O3 is a bleaching action; the chromophore structure of the anthraquinone dye is destroyed to give the colorless phthalic acid reaction product. Dyed acetate fabrics were exposed to 10 pphm of O3 in Ames, Iowa and 1-6 pphm in suburban New Jersey. In Ames, all blue and some red anthraquinone dyes were sensitive to change, while azo red, yellow dyestuffs, and diphenylamine yellow dyes were not affected. Results were similar in New Jersey. Known antioxidants, as diphenylethylenediamine, inhibit O3 fading on cellulose acetate and triacetate. Disperse dyes on polyester and most vat dyes are not normally vulnerable to atmospheric fading by nitrogen oxides, O3, or sulfur dioxide, unless the fabric is subjected to post curing or precuring. Textured polyesters can fade from O3 due to the migration of the dye under high temperatures to the nonionic surfactant used in the surface finish for the fiber. Humidity is a definite factor in the rate of color change with O3. Ozone fading tests at low humidity showed no changes with some dye fiber combinations, but an 85-90% relative humidity produced pronounced color fading. There are two AATCC procedures for assessing O3 colorfastness: one is for high relative humidity, and the other specifies that the humidity not exceed 65%.

1972

46160 **APTIC NO. 68891**

Verbanc, J. J.

RUBBER CHEMICALS FOR TIRE STOCKS. *Du Pont de Nemours (E.I.) and Co., Wilmington, Del., Elastomer Chemicals Dept., Rept. 282, 22p., 1972 (?). 10 refs.*

The chemical composition of rubber tire stocks is discussed, with reference being made to the use of oxidation inhibitors and antiozonants to retard tire degradation. Diene hydrocarbons and the tire polymers derived from them are prone to attack by oxygen and ozone. Oxidation of the polymer leads to marked physical changes in the tire and the formation of volatile fragments which escape into the air. Chemical attack by ozone presents a much more difficult practical problem than does oxygen since the chemical changes are more rapid and physical damage to the rubber more extensive. The structures of various ozone inhibitors are illustrated.

1968

46161 **APTIC NO. 68892**

Nishihata, Mikio, Yohta Sato, Shouichi Kato, Yoshinori Isoe, and Takashi Onoyama

THE EFFECT OF ATMOSPHERIC EXPOSURE ON FATIGUE STRENGTH OF A STAINLESS STEEL WIRE SPRING FOR A RELAY. *(Tsushin-kiki-yo sutenresu bane-zairyo no hiro-kyodo ni oyobosu taiki-boro no eikyo). Nippon Kinzoku gakkaishi (J. Japan Inst. Met.), vol. 32:1305-1310, 1968. Translated from Japanese. Scientific Translation Service, Santa Barbara, Calif., 15p., 3 refs. (Presented at the Japan Metallurgical Society Congress, Sapporo, Japan, Oct. 1967.)*

Investigations on the effect of long-term atmospheric exposure of stainless steel wire used as contact spring material in electrical relays were performed in various Japanese cities. Corrosion problems were greatest in the most highly polluted and industrial areas. Nickel-silver wire exhibited the worst corrosion and discoloration, with stress corrosion cracks appearing after 1 month. Pitting occurred in stainless steel and nickel-coated stainless steel wires. Analysis of the corrosion products indicated that sulfur and chloride were present in stress corrosion cracks and pitting areas. Thus, the deterioration appeared due to sulfur dioxide and chloride air pollution. Tensile strength for stainless steel and nickel-coated stainless steel remained the same throughout the exposure experiments, while that of nickel-silver dropped from 87 to 34 kg/sq mm.

EFFECTS-ECONOMIC

1974

46162 **APTIC NO. 68556**

Bouscaren, R.

ASSESSMENT OF THE COST OF AIR POLLUTION PREVENTION IN THE FRENCH INDUSTRY. *(Evaluation du cout de la prevention de la pollution atmospherique dans l industrie en France). Text in French. C.I.T.E.P.A. (Technical Interprofessional Study Center for Air Pollution), Etudes Documentaires 42, Cl 800, 17p., 1974.*

An evaluation is given of the costs of air pollution prevention in the French industry in the 1971-1975 period, and related considerations about the iron and steel industry, waste incineration, foundries, and cement works are presented. The air pollution control-related investments will result chiefly in the dust emission abatement, and are expected to cause price increases ranging from 0.1 to 3.6%. Provided all waste incinerators are equipped with dust separators by 1975, the yearly dust emission from such plants will decrease from 61,000 tons to 17,000 tons, and the costs of waste incineration will rise by 2 to 3%. Moderaization of the steel mills with general dust separation would result in an abatement of the dust emissions from 200,000 tons to 150,000 tons yearly resulting in price increases of 0.4-0.6%. Dust seperation in the cement industry would require an investment of 20 F per ton of yearly capacity.

46163 **APTIC NO. 68644**

Hayashi, Masami, Henry Dolezal, and J. H. Bilbrey, Jr.

COST OF PRODUCING COPPER FROM CHALCOPYRITE CONCENTRATE AS RELATED TO SO2 EMISSION ABATEMENT. AN EVALUATION OF FIVE SMELTING PROCEDURES. *Bureau of Mines, Salt Lake City, Utah, Salt Lake City Metallurgy Research Center, RI 7957, 91p., 1974.*

Cost evaluations were made for five processes for producing 100,000 tons of electro-refined copper per year from a chalcopyrite concentrate. The processes were conventional smelting with all furnace gases vented to the atmosphere; conventional smelting with converter gases routed to an acid plant and reverberatory gases vented to the atmosphere; conventional smelting with converter gases routed to an acid plant and reverberatory gases to a citrate system plant; and a modified smelting process in which the concentrate is roasted before being charged to the reverberatory furnace, with roaster and converter gases routed to an acid plant. The total fixed capital costs of the plants were estimated as $56.7, $77.4, $87.2, $73.9, and $77 million, respectively. Total sulfur dioxide removal from stack gases as sulfuric acid or sulfur for each process was none, 66%, 99%, 98%, and 78%, respectively. Assuming no credit for by-product sulfur or sulfuric acid, total operating costs per pound of electro-refined copper produced were estimated as $0.81, $0.103, $0.119, $0.111, and $0.103, respectively. (Author abstract)

46164 **APTIC NO. 68833**

Rehman, C. A., R. J. Schoeppel, and J. H. Sherrard

AN IMPACT ANALYSIS OF NATURAL AND MAN-MADE FACTORS AFFECTING REGIONAL AIR QUALITY IN TERMS OF COSTS-BENEFITS. *Louisville Univ., Speed Scientific School, Ky.; International Assoc. for Pollution Control; American Chemical Society, Washington, D. C.; American Inst. of Chemical Engineers, New York; American Inst. of Industrial Engineers, New York; American Society of Civil Engineers, New York; American Society of Mechanical Engineers, New York; American Water Works Assoc., New York; Inst. of Electrical and Electronic Engineers, New York; and Water Pollution Control Assoc., Environ. Eng. Sci. Conf., Annu. Meet., Louisville, Ky., 1974, p. 109-129. 8 refs. (March 4-5.)*

Some trade offs between the benefits of pollution control and the costs are necessary. In order to arrive at these trade offs intelligently, the following questions must be answered: given the economic conditions, what level of air pollution is acceptable; what should be done to achieve this optimum level; and how can costs be fairly passed on to those persons who contribute to pollution? Each of these questions is discussed. A rational procedure is given for estimating a series of the most probable costs that could be passed on to the polluters depending upon their relative contributions to the deterioration of the community air. The approach tends to pinpoint what decisions must be taken by management to avoid future mishaps in the community under study. The approach provides a rational setting where a community can select how much pollution it can afford by now allowing enough money to combat pollution. By assessing the unfair damages that are unknowingly caused through accidents, the approach provides a factual basis to provide renumerations to those who are affected by pollution. A detailed classification of sources of pollution and factors of emission associated with each of the sources is also given. (Author conclusions modified)

46165 **APTIC NO. 68829**

Taussig, Joseph K., Jr.

SOME PRACTICAL ECONOMIC ASPECTS OF THE ENERGY CRUNCH. *Louisville Univ., Speed Scientific School, Ky.; International Assoc. for Pollution Control; American Chemical Society, Washington, D. C.; American Inst. of Chemical Engineers, New York; American Inst. of Industrial Engineers, New York; American Society of Civil Engineers, New York; American Society of Mechanical Engineers, New York; American Water Works Assoc., New York ; Inst. of Electrical and Electronic Engineers, New York; and Water Pollution Control Assoc., Environ. Eng. Sci. Conf., Annu. Meet., Louisville, Ky., 1974, p. 3-11. (March 4-5.)*

The energy crisis is generally reviewed, and the economics of the crisis are discussed. The advantages and disadvantages of conversion of solid wastes into energy are reviewed. Incineration, landfills, and other solid waste disposal techniques are reviewed with respect to economics, air pollution, and energy.

46166 **APTIC NO. 68827**

Real Estate Research Corp.

THE COSTS OF SPRAWL. EXECUTIVE SUMMARY. *16p., April 1974.*

GPO

The costs of sprawling urban development in terms of impacts to air and water pollution, wildlife, open space, energy consumption, water consumption, and effects on persons living in the area are discussed. Prototype development patterns were studied to analyze economic costs, environmental effects, and personal effects. Higher density developments require less energy for heating, and higher density and better planned communities stimulate less automobile use. Thus, the high density planned community generates about 45% less pollution than the low density sprawl community. Planning can reduce the amount of pollution from automobiles by 20 to 30%. High density development can also reduce water pollution. Planning is the key to eliminating noise problems, preserving valuable wildlife and vegetation, and creating a visually attractive development. Planning and increased density can save up to 44% of the total energy consumed.

1973

46167 **APTIC NO. 68431**

Cesario, Frank J.

OPTIMAL ROAD PRICING FOR AIR POLLUTION CONTROL. *Reg Sci. Assoc. Pap., vol. 30:97-110, 1973. 9 refs. (Presented at the Regional Science Association, Philadelphia, Pa., Nov. 1972.)*

Existence of substantial (external) social costs of automobile travel can result in a suboptimal allocation of transportation resources. One possible way of ameliorating the problem involves assessing each highway user a charge commensurate with the social costs he inflicts on others. The problem of establishing the appropriate social charges or tolls to be levied is discussed. A pollution model based on a marginal cost pricing concept is developed that builds on the discards the Walters model for congestion. It is argued that a zero or negligible price for vehicle usage over highway networks results in a suboptimal allocation of transportation resources. The marginal vehicle imposes positive costs not only on other road users traveling on the same highway (congestion costs) but also on certain nonusers as well (pollution costs). If the vehicle operator is not required to pay a price for the use of the highway, the marginal private cost to the user will be exceeded by the net marginal social costs (i.e., an aggregation of the external marginal private costs). Imposition of toll which reflect the marginal social cost of vehicle usage would result in a more efficient utilization of the highway network. A method was developed whereby the optimum tolls can be calculated, given certain simplifying assumptions on the relationships between travel demand and road prices, and between social cost and travel demand. The model was used to examine pricing policies on some simple road networks. (Author conclusions modified)

46168 **APTIC NO. 69134**

Downing, Paul B. and William D. Watson, Jr.

ENFORCEMENT ECONOMICS IN AIR POLLUTION CONTROL (FINAL REPORT). *Virginia Polytechnic Inst. and State Univ., Blacksburg, Va. and Environmental Protection Agency, Washington, D. C., Implementation Research Div., Program Element 1HA094, Rept. EPA-600/5-73-014, 111p., Dec. 1973. 15 refs.*

GPO

A model of enforcement economics in air pollution control is used to assess the minimum total resource costs to both the industrial firm and the pollution control agency. A simulation of current enforcement of the Federal standard for new source particulate matter emissions from coal-fired power plants indicates that cost-minimizing power plants will install relatively costly pollution control technology and frequently violate Federal fly ash standards. Two alternative enforcement strategies for overcoming these shortcomings, viz., compliance tests in combination with emission taxes and emission taxes alone, are analyzed. The lowest out-of-pocket cost to the firm is a compliance test and opacity standard (with inflexible technology), while an emission tax only (with flexible technology) results in the highest cost to the firm. On the other hand, a comparison of resource costs for flexible technology gives the opposite ordering. Enforcement agencies are advised to give careful consideration to management costs imposed on the firm and control agency by an implementation and enforcement scheme. In the case of the Federal fly ash discharge standard for coal-fired power plants, emission tax enforcement will tentatively result in a minimization of the sum of firm and enforcement agency resource costs.

46169 **APTIC NO. 63064**

McLean, John G.

ENERGY AND ECOLOGY. *Chem. Eng. Progr., 69(5):29-36, May 1973. (Presented at the 4th Annual Meeting of the Petroleum and Petrochemical Division of American Institute Chemical Engineers held in conjunction with the 74th National Meeting, New Orleans, La., March 1973.)*

The United States energy outlook and its economic and political implications are summarized, with the suggestion being made for a more balanced development of energy and ecology. The energy problem is a medium-term problem in terms of developing potential resources fast enough to meet growing requirements in the next 10-15 years. Energy requirements are estimated to double between now and the middle 1980 s and will probably rely upon the four conventional fuels, oil, gas, coal, and nuclear power, though these fuels are not likely to be developed fast enough to meet energy needs in the period immediately ahead. A growing volume of oil and gas may have to be imported from overseas, and a fuel trade deficit of some $20 billion is possible by the mid-1980 s. Constructive suggestions for counteracting the energy problem are given and include: stimulating the development of indigenous energy resources by an acceleration in the leasing of federal lands for energy development, seeking reasonable modifications in the ecological restraints presently inhibiting energy development, and by permitting fuel prices to reach competitive market levels.

46170 **APTIC NO. 68608**

Miernyk, William H.

A REGIONAL INPUT-OUTPUT POLLUTION ABATEMENT MODEL. IEEE (Inst. Elect. Electron. Engrs.) Trans. Syst., Man, Cybern., 3(6): 575-577, Nov. 1973. 8 refs.

The technical and capital coefficients of a dynamic regional input-output model are being revised to include the costs of installing and operating air pollution abatement equipment. The total cost of air pollution abatement in the region will be estimated by comparing the value of direct and indirect inputs required to produce a fixed bill of goods before and after the installation of abatement equipment. (Author abstract)

46171 **APTIC NO. 68415**

Mutschler, P. H., R. J. Evans, and G. M. Larwood

COMPARATIVE TRANSPORTATION COSTS OF SUPPLYING LOW-SULFUR FUELS TO MIDWESTERN AND EASTERN DOMESTIC ENERGY MARKETS. *Bureau of Mines Information Circ., no. 8614:1-54, 1973. 17 refs.*

GPO

The costs of tranporting fossil fuels, coal, and residual fuel oil from areas of production to consumer regions are reviewed. Transportation data were stratified by type of carrier, size of shipment, and distance to determine what general effects these variables have upon transportation costs. Economies of haul for coal exist for longer versus shorter distances, and for larger versus smaller trainload sizes. Tanker and barge transportation of residual fuel oil does not show economies of haul for longer distances. Tanker size and seasonal variation are primary factors influencing the cost of shipping. Stricter air quality standards will place constraints upon the use of high-sulfur fossil fuel in the East and Midwest, and new sources of low-sulfur fuels will be needed. Western coal is generally lower in sulfur content than eastern coal and constitutes a possible source. The dominant low- sulfur fossil fuel in the eastern market is foreign residual fuel oil. Railroad transportation data show that coal from western coalfields could be competitive with foreign residual fuel oil in selected midwestern fossil fuel markets. However, the western coal would not be competitive in the New England and eastern seaboard energy markets. (Author abstract modified)

46172 **APTIC NO. 68313**

Dept. of Commerce, Washington, D. C., Bureau of the Census

SELECTED INDUSTRIAL AIR POLLUTION CONTROL EQUIPMENT 1973 (FINAL REPORT). *Series MA-35J(73)-1, 4p., Aug. 1974.*

Annual data for 1972 and 1973 on the shipments and backlog of orders of selected industrial air pollution control equipment used in the separation, removal, or collection of particulate and gaseous emissions are presented based on a Bureau of Census survey. The survey is divided into two parts. The first presents data on quantity and value of new orders, shipments, and backlog of orders at year end; and the second provides the value of the equipment shipped, by end use. The value of shipments of selected industrial air pollution control equipment in millions of dollars for the 1973 year is broken down as follows: electrostatic precipitators, 113.9; fabric filters, 90.1; mechanical collectors, 25.7; wet scrubbers, 25.6; catalytic and thermal oxidation systems, 8.9; gas absorbers scrubbers, 2.1; and nonliquid gas adsorbers, 2.0. Revised figures for 1972 in the same order of control device are: 76.1, 73.1, 17.2, 22.9, 4.9, 3.5, and 1.7. The figures represent all known producers of the products covered.

46173 **APTIC NO. 68315**

Dept. of Commerce, Washington, D. C., Bureau of the Census

SELECTED INDUSTRIAL AIR POLLUTION CONTROL EQUIPMENT 1972 (FINAL REPORT). *Series MA-35J(72)-1, 5p., Aug. 1973.*

Annual data for 1972 and 1971 on the shipments and backlog of orders of selected industrial air pollution control equipment used in the separation, removal, or collection of particulate and gaseous emissions are presented based on a Bureau of Census survey. Data from a 1967 census of manufacturers are also presented. The survey is divided into two parts. The first presents data on the quantity and value of new orders, shipments, and backlog of orders at year end, while the second provides the value of the equipment shipped, by end use. The value of shipments of selected industrial air pollution control equipment in millions of dollars for the 1972 year is broken down as follows: electrostatic precipitators, 71.1; fabric filters, 61.7; mechanical collectors, 16.2; wet scrubbers, 17.5; catalytic and thermal oxidation systems, 2.1; gas absorber scrubbers, 3.5; and nonliquid gas adsorbers, 1.7. Revised figures of 1971 in the same order of control device are: 57.3, 43.2, 15.0, 18.4, and 4.5 (a combined figure for catalytic and thermal oxidation systems, gas absorbers, and gas adsorbers). The figures represent all known producers of the products covered.

46174 **APTIC NO. 68541**

Voorhees (Alan M.) and Associates, Inc., McLean, Va.

AN ANALYSIS OF THE ECONOMIC IMPACT OF MOTOR VEHICLE USE RESTRICTIONS IN RELATION TO FEDERAL AMBIENT AIR QUALITY STANDARDS (FINAL REPORT). *Motor Vehicle Manufacturers Assoc. Contract MVMA-ECON2-AMV, Rept. MVMA-AMV-73-02, 76p., Sept. 1973. 17 refs.*

NTIS: PB 227923

A cost-effectiveness methodology was developed for evaluating transportation control strategies as a means of achieving ambient air quality objectives using Baltimore and Boston as case studies. The methodology is mainly discussed, with the means of making estimates of emission reductions, costs, and benefits described in the appendix. The methodology calls for explicit identification of air pollution reduction potentials of alternate control strategies as well as the costs incurred by public agencies, users, and other groups of interest. The costs and effects are presented in graphic form to indicate the relative average cost per unit of emission reduction for each alternative, thereby making it possible to order the strategies in terms of desirability on the basis of cost-effectiveness. Retrofit and emission inspection/maintenance programs were particularly cost-ineffective. System improvement strategies were generally cost-effective from the composite viewpoint of costs to the user and to public agencies. The motor vehicle use retraints discussed included vehicle-free zone, parking bans, gasoline rationing, pricing policies, improved transit service, staggered work hours, taxes, improvements of traffic flow, increased parking costs, and reduced transit fares. (Author abstract modified)

1972

46175 **APTIC NO. 68422**

Mathur, Vijay K. and Hiroyuki Yamada

AN ECONOMIC THEORY OF POLLUTION CONTROL. *Reg. Sci. Assoc. Pap., vol. 28:223-235, 1972. 4 refs. (Presented at the Regional Science Association, Ann Arbor Meeting, Nov. 1971.)*

Two economic models are presented to analyze the desired or optimum amount of pollution concentration in a region and the conditions which must be satisfied to obtain the optimum and the pollution charges which must be levied by a public authority on pollution generating goods in order to maintain the global optima. The first model is a basic model, the second, an extended model. The basic model gives the optimal pollution conditions and the pollution charge were only the externality of pollution from one pollution source is considered. This model is neutral as to the type of abatement followed; thus, no distinction was made between public and private abatement. An example is presented to show the working of the basic model. In the extended model, two polluting goods (y1 and y2), private and public abatement, and two externalities are considered. The first externality occurs where two flows of pollution resulting from sources y1 and y2 affect each other via the overall pollution concentration. The second is an externality of the public abatement good to the individual flows of pollution from two sources. The extended version tries to obtain the optimal conditions and the optimal pollution charges in the presence of all externalities and can be applied to an n commodities case. The main limitation is that the problem of raising money for public abatement has not been dealt with. To derive the optimal level of pollution concentration in a region and the optimal shadow prices of goods and pollution and the resultant pollution charges, one has to account for not only the various trade-offs in production and consumption, but also the various types of externalities of pollution and abatement. (Author conclusions modified)

1971

46176 **APTIC NO. 68378**

Miernyk, William H.

ENVIRONMENTAL MANAGEMENT AND REGIONAL ECONOMIC DEVELOPMENT. *Preprint, Southern Economic Assoc. and the Southern Regional Science Assoc., 23p., 1971. 22 refs. (Presented at the Southern Economic Association and the Southern Regional Science Association, Miami Beach, Fla., Nov. 6, 1971.)*

Preliminary results are presented from a long-range investigation of the trade-offs between environmental management and regional economic development in West Virginia using a regional variant of Leontief s augmented input-output model with built in pollution- related activities and the West Virginia dynamic regional model. The West Virginia model is a dynamic variant which includes expansion and replacement capital coefficients along with tables of labor coefficients. Trade-offs between air pollution abatement and regional economic development in West Virginia are illustrated by introducing Leontief s national pollution output coefficients into the model in conjunction with the West Virginia input coefficients projected to 1975 since the collection of data for the calculation of regional pollution output coefficients is still underway in the West Virginia study. Direct and indirect air pollution coefficients for particulates, sulfur oxides, hydrocarbons, carbon monoxide, and nitrogen oxides, i.e., emissions in thousands of tons generated directly and indirectly per million dollars worth of each sectors s sale to final demand, are tabulated. Complete implementation of the Leontief model will necessitate expressing the relationship between production and pollution in terms of prices and values-added which will require the collection of specific price data.

STANDARDS AND CRITERIA

1974

46177 **APTIC NO. 68714**

Abel, Dorothy J. (comp.)

GUIDE TO STATE STATIONARY SOURCE EMISSION STANDARDS. *Instr. Control Systems, vol. 47:27-39, 1974.*

State emission standards are listed for the following sources: fossil-fuel burning equipment; process industries; sulfuric acid plants; nitric acid plants; hot mix asphalt plants; chemical fertilizer plants; petroleum refineries; sulfur recovery plants; ferrous and nonferrous foundries; sintering plants, blast furnaces, and basic oxygen furnaces; primary aluminum plants and secondary metals operations; kraft pulp mills; sulfite pulp mills; Portland cement plants; incinerators; and other sources. Pollutants covered include particulates, sulfur compounds, nitrogen oxides, sulfur oxides, hydrogen sulfide, carbon monoxide, opacity, and lead.

46178 **APTIC NO. 65987**

Brasser, L. J.

RELATING AIR QUALITY DATA TO STANDARDS. *Autom. Air Qual. Monit. Syst., Proc. Conf., Bilthoven, Netherlands, 1973, p. 225-234, 1974. 7 refs. (June 5-8.)*

The air quality standards of the Netherlands are described. A compilation of the proposed standards for sulfur dioxide is given. Since air quality data can be presented as a mostly log-normal frequency distribution, the standard has to agree with this phenomenon. Some ways of comparing standards with measured air quality situations are presented, among others using a test index. The test index is a very versatile way to present air quality. (Author summary modified)

46179 **APTIC NO. 68582**

Brun, M.-J. and P. Jarrault

MAXIMUM ALLOWABLE CONCENTRATIONS AND EMISSIONS LIMITED FOR INDIVIDUAL POLLUTANTS, INDUSTRIES, AND COUNTRIES ACCORDING TO STANDARDS AND RECOMMENDATIONS. *(Teneurs limites dans l air ambient et a l emission. Valeurs par polluant, par industrie, par pays d apres les normes et recommendations). Text in French. C.I.T.E.P.A. Technical Interprofessional Study Center for Air Pollution, Etudes Documentaires 42, CI 805, CI 809, 53p., Feb. 1, 1974.*

Maximum allowable concentrations and emissions from different sources of dust, sulfur dioxide, carbon monoxide, hydrogen sulfide, nitrogen oxides, chlorine, hydrochloric acid, fluorine, hydrocarbons, and heavy metals, as recommended or imposed by acts or standards in various countries, such as Bulgaria, Belgium, Canada, U.S.A., Finland, France, the Netherlands, Israel, Italy, Japan, West Germany, East Germany, Rumania, Sweden, Czechoslovakia, Turkey, and the USSR are listed. Percentages of the times during which the maximum allowable concentrations may be exceeded are given. Detailed listings are presented of the maximum allowable emissions from various sources, such as the metallurgical, chemical, and pulp and paper industries, waste incineration, domestic heating, cement works, petroleum refining, power generation, and surface treatment.

46180 **APTIC NO. 68437**

Fujii, Sadao

THE REVISION OF MEASUREMENT METHODS AND POLLUTANT MEASUREMENT TECHNICIANS. *(Keiryoho no kaisei to kogai keiryoshi). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 10(9): 996-1000, Sept. 1974.*

The implementation of the revised regulations for weights and measures with respect to pollution is discussed. Measuring devices should come under federal inspection. Measurement methods should be standardized. Federal standards should be established for chemical materials which are to be used as references. Those technicians who are to take the measurements should be certified by means of federal examinations.

46181 **APTIC NO. 68446**

Hasegawa, Yutaka

CONTROL REGULATIONS FOR GASOLINE LEAD ADDITIVES. *(Gasorin e no entenka no kisei ni tsuite). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 30:43-59, July 1974.*

The danger of air pollution by lead in automotive gasoline was first noted in May 1970 when the news of a hazardous lead episode was reported in a busy central section of Tokyo. In August of the same year, the Ministry of International Trade and Industry already announced the target date for a complete removal of lead from gasoline to be April 1974. Subsequent research and observations disclosed the possibility of valve seat recession that can be caused by unleaded gasoline to automobiles manufactured before March 1972; this caused the postponement of the target date by three years. In the United States also, the announcement of the Environmental Protection Agency concerning lead regulation in gasoline, subsequent bills, and committee hearings caused the bitter opposition of gasoline industries, and EPA was sued by the Ethyl Corporation in December 1972. The 1973 regulations of the EPA on fuel and gasoline lead additives contain the newest facts and data and seem to be extremely useful for the understanding of the effects of lead on human health.

46182 **APTIC NO. 69049**

Sakurai, Yoshio

A SERIOUS REBUTTAL OF THE THEORY OF THE CRIME OF AUTOMOBILES. *(Wagashisei o tadashite kuruma zaiakuron ni mono mosu). Text in Japanese. Sangyo to Kankyo (Ind. Environment), 3(11): 67-70, Nov. 1974.*

Auto makers have been unfairly treated by government agencies. Despite new developments in nitrogen oxides prevention techniques, the auto industries have complained that the auto emission standards for 1975 and 1976 are too strict for them to comply. The research and development spending by 9 auto makers on exhaust prevention has increased from $18 million in 1969 to $156 million in 1973. The environmental standard for NOx in Japan is the strictest in the world. It is 0.02 ppm compared to 0.04 ppm in the USSR, 0.1 ppm in the U. S. (0.07 ppm in California), and 0.1 ppm in Italy. It is incorrect to argue that the NOx emission standard must be 8 times lower in Japan than that in the U. S. because the number of automobiles per unit area in Japan is 8 times higher, since the fuel consumption per unit area in the U. S. is 3 times higher.

46183 **APTIC NO. 69050**

Suzuki, M.

REGULATIONS OF THE TOTAL AMOUNT OF POLLUTANTS BY LOCAL GOVERNMENTS. *(Chiho jichi-tai ni okeru soryo kisei). Text in Japanese. Kagaku Kojo (Chem. Factory), 18(9):64, Sept. 1974.*

It is stipulated in the air pollution prevention law of 1968 that the exhaust standard for air pollutants should be the same throughout the country and that local governments can establish more severe standards in accordance with their respective situations. The government, however, established different standards for sulfur oxides according to the respective local situations without allowing more severe standards. Some local governments, however, are likely to set more severe regulations. Tokyo has changed from its previous standard to a method of calculating the exhaust standard for sulfur oxides with one factory as the unit of calculation. This, in effect, has intensified the regulations. Many other local governments have decided to adopt this method. Other methods adopted are also discussed.

46184 **APTIC NO. 68954**

Watanabe, Hiroshi

WAY OF THINKING ABOUT THE ENVIRONMENTAL STANDARD FOR SULFUR OXIDES. *(Iwo sankabutsu kankyo kijun no kangaekata). Text in Japanese. Ao to Midori (Blue Green), 3(7):66-70, July 1974.*

The work of various Japanese committees for the formulation of sulfur oxides standards is reviewed. The World Health Organization classification system for pollutant levels is discussed in detail and a 4-level index of harmfulness is described. The first level is that combination of concentration and exposure time for which only indirect effects on health can be observed. The second level is that at which human sense organs are irritated, plants are damaged, and visibility is reduced. The third level is that at which chronic diseases are induced and longevity is shortened. The fourth level is that which results in acute disease or death.

46185 **APTIC NO. 68658**

THE END OF THE JAPANESE VERSION OF THE MUSKIE LAW - A BIG QUESTION. *(Do naru? Nihonban Masuki-ho no yukue). Text in Japanese. PPM (Japan), 5(9):2-7, Sept. 1974.*

The stringent automotive exhaust gas regulation standards based on the Muskie Law were originally to take effect temporarily in 1975 with a 90% reduction of carbon monoxide and hydrocarbons and a 45% reduction of nitrogen oxides for newly sold cars as of April 1975. They were to be enforced as permanent standards as of 1976. But at the hearing of automobile manufacturers held in June 1974 at the Environmental Agency, the enforcement of these standards on the scheduled dates became extremely questionable. The manufacturers put up strong objections to the standards and the dates because it is technically impossible to attain the figures by the designated date. The Central Pollution Council is examining the data presented by the manufacturers for the final decision in November. The standards were to be, for 1 km of driving, 2.1 g average of CO, 0.25 g of HC, and 1.2 g of NOx by 1975, and by 1976, the NOx figure was to be further decreased to 0.25 g. This last was believed to be the strictest standard in the world. Various manufacturers object ot the 1975 figure of HC because of lack of technical ability to control NOx emission to 0.25 g per 1 km by 1976. Nissan has been able to develop a reactor, NVCC engine, and a rotary engine to meet the 1976 standards, but some problems remain in the area of catalysts and fuel cost and total exhaust emissions. The manufacturers are generally showing lack of cooperative spirit and some of them failed even to present the requested data for provisional standards. While the Environmental Agency is disappointed and unhappy with the attitude of the manufacturers, a compromise is expected to be reached.

46186 **APTIC NO. 68709**

The Central Council for Pollution Control and the Committee for Automotive Pollution Control, Japan

POLICY FOR A LONG-TERM EFFECTUATION OF MAXIMUM ALLOWABLE STANDARDS FOR AUTOMOTIVE EMISSION GASES (PROGRESS REPORT). *(Jidosha haishutsu gasu kyoyo gendo choki settei hosaku ni tsuite (chukan hokoku)). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 30:16-20, July, 1974.*

The maximum allowable automotive exhaust concentration must be revised and enforced in Japan because it has the second largest number of automobiles in the world, totaling about 30 million; the number of automobiles per unit area of the country is largest in the world, about 8 times that of the U. S. in 1969; and the automobiles are concentrated in large cities. The maximum allowable concentrations for automobiles using gasoline and liquefied petroleum gas were determined for various testing modes corresponding to the actual running conditions on the streets of Japanese cities. The allowable concentrations for automobiles manufactured after April 1975 were: carbon monoxide, 2.1 g/km; hydrocarbon, 1.25 g/km; nitrogen oxides, 1.2 g/km. The allowable NOx concentration for automobiles manufactured after April 1976 is 0.25 g/km. The new standards can only be attained by the improvement of the automobile engine, improvement and development of catalysts and heat-resisting materials, and the improvement of gasoline. Establishment of a better system for used car inspection is expected to play an important role.

46187 **APTIC NO. 68868**

National Academy of Sciences-National Academy of Engineering, Washington, D. C., Coordinating Committee on Air Quality Studies

AIR QUALITY AND AUTOMOBILE EMISSION CONTROL. VOLUME 1. SUMMARY REPORT. *93rd Congress (Senate), 2nd Session, Serial 93-24, 139p., Sept. 1974. 39 refs. (Prepared for the Committee on Public Works pursuant to S. Res. 135, approved Aug. 2, 1973.)*

GPO

In general, the evidence that has accumulated since the promulgation of the Federal ambient air quality standards supports those standards, and no substantial basis was found for changing the standards. The Panel on Nitrogen Dioxide did suggest that consideration be given to establishing an hourly as well as an annual standard for nitrogen dioxide. The Federal ambient air quality standards for carbon monoxide can be met by 1990 even with some relaxation of present emission standards. The Federal emission standard of 0.4 g/mi for nitrogen oxide may be more stringent than needed to achieve the NO2 air quality standard. The existing analyses relating NOx emissions to subsequent oxidant formation are inadequate. At least in the Los Angeles area, the Federal hydrocarbon emission standard of 0.41 g/mi may not be sufficient to ensure compliance with the national oxidant air quality standard, but present analyses are inadequate to justify changes in the Federal motor vehicle emission standard for HC. All these conclusions assume that emissions from heavy vehicles and stationary sources are reduced in the same proportion as emissions from light vehicles and that relatively modest safety margins are satisfactory. The annual benefits from improving air quality from present levels to levels of Federal ambient air standards for automobile-derived pollutants are estimated at $2.5-10 billion. Costs of reaching the emission standards at target dates may range from $8-5 billion/yr. Policy options could reduce the costs further. The benefits from implementing emission standards are commensurate with expected cost, and several policy options could lower costs below benefit levels. The health effects of CO, NOx, photochemical oxidants, ozone, particulates, and sulfur oxides; synergism; thresholds; and pollution effects on plants and ecologic systems are discussed in appendices. (Author summary modified)

46188 **APTIC NO. 69106**

Office of Air and Waste Management, Research Triangle Park, N. C., Emission Standards and Engineering Div.

BACKGROUND INFORMATION FOR STANDARDS OF PERFORMANCE: ELECTRIC SUBMERGED ARC FURNACES FOR PRODUCTION OF FERROALLOYS. VOLUME 1: PROPOSED STANDARDS (FINAL REPORT). *Rept. EPA-450/2-74-018a, 163p., Oct. 1974. 123 refs.*

NTIS: PB 237411/AS

Background information for proposed standards of performance for electric submerged arc furnaces in the ferroalloy industry are presented in connection with formal proposals appearing in the Federal Register. Topics covered include: processes and emissions from the ferroalloy industry; proposed mass standards and opacity standards; emission control technology involving open furnaces, semi-enclosed furnaces, sealed furnaces, and control of fumes during tapping; environmental effects in relation to air, water, solid waste pollution, and energy considerations; procedures for developing standards; data for substantiating standards; economic information, including control costs and economic impact; alternative standards for particulate matter, carbon monoxide, and visible emissions; and enforcement aspects of proposed standards, including emission monitoring. Data are given for estimated ground level particulate concentrations caused by submerged arc ferroalloy furnaces at various downwind distances as well as for emission rate comparisons between controlled and uncontrolled furnaces.

46189 **APTIC NO. 69115**

Office of Air and Waste Management, Research Triangle Park, N. C., Emission Standards and Engineering Div.

BACKGROUND INFORMATION FOR STANDARDS OF PERFORMANCE: COAL PREPARATION PLANTS. VOLUME 1: PROPOSED STANDARDS (FINAL REPORT). *Rept. EPA 450/2-74-021a, 58p., Oct. 1974. 7 refs.*

NTIS: PB 237421/AS

Proposed standards of performance for coal preparation plants (both wet cleaning and dry cleaning systems) are presented. The proposed standards limit emissions of particulates (including visible emissions) from the following sources: thermal driers, pneumatic coal-cleaning equipment (air tables), coal processing and conveying equipment (including breakers and crushers), screening equipment, coal storage, coal transfer points, and coal loading facilities. The standards apply at the point(s) where undiluted gases are discharged from the air pollution control system or from the affected facility if no air pollution control system is utilized. Particulate matter from thermal driers would be limited to no more than 0.070 g/dry standard cu m and less than 30% opacity, while particulates from pneumatic coal-cleaning equipment would be limited to no more than 0.040 g/dry standard cu m and less than 20% opacity. Particulate matter from other affected facilities would be limited to less than 20% opacity. Background information on the following topics is also provided: process description, emissions and methods of control, existing air pollution standards, the rationale for proposed standards, and the environmental and economic impacts of the proposed standards.

46190 **APTIC NO. 69138**

Office of Air and Waste Management, Research Triangle Park, N. C., Office of Air Quality Planning and Standards

BACKGROUND INFORMATION FOR NEW SOURCE PERFORMANCE STANDARDS: PRIMARY COPPER, ZINC, AND LEAD SMELTERS. VOLUME I: PROPOSED STANDARDS. *Rept. EPA-450/2-74-002a, 787p., Oct. 1974. 110 refs.*

NTIS: PB 237832/AS

Background information for new source performance standards for new and modified primary copper, zinc, and lead smelters is presented. Information includes the various extraction processes available for Cu, Zn, and Pb, the various systems available for controlling emissions of sulfur oxides and particulate matter from these processes, the economic impact of the proposed standards, the environmental and energy consumption effects associated with the various processes and control systems, and the general rationale for the proposed standards. The standards developed require control at levels typical of best demonstrated existing technology. These levels were determined by extensive on-site investigations; consideration of process design factors, maintenance practices, available test data, and characteristics of plant emissions; comprehensive literature examination; and consultations with the National Air Pollution Control Techniques Advisory Committee, members of the academic community, and industry. (Author abstract modified)

1973

46191 **APTIC NO. 68919**

Walters, Donald F. and Don R. Goodwin

FEDERAL EMISSION STANDARDS FOR STATIONARY SOURCES. *Preprint, American Inst. of Chemical Engineers, New York, 22p., April 20, 1973. 9 refs. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 65th, New York, Nov. 1972.)*

The legislation which set up Federal emission standards for stationary sources and the standards themselves are discussed. Section 111 of the Clean Air Amendments of 1970 authorizes the establishment of standards of performance for new air pollution sources. Congress felt that maximum use of available means of controlling air pollution is essential to the elimination of new air pollution problems while cleaning up existing sources, and that maximum feasible control of new sources at the time of their construction is the most effective and least expensive approach in the long run. A conceptual framework for the new source performance standards is discussed. The standards for new or substantially modified stationary sources are summarized. Section 112 of the Clean Air Amendments provides for the control of hazardous pollutants through establishment of national emission standards for new and existing standards. These standards for mercury, beryllium, and asbestos are summarized. Standard development and review processes are discussed. Government, industrial, and committee advice is used in developing standards. Other sections of the Clean Air Act are discussed including: Section 114 which gives the Environmental Protection Agency the right to make inspections and to monitor pollution and to disseminate information to the public; Section 113 which allows the Administrator to issue orders or seek injunctions; and Section 307 which provides for judicial review of actions of the Administrator. Other important provisions of the Clean Air Act are noted.

46192 APTIC NO. 68384

Office of Air and Water Programs, Research Triangle Park, N. C., Office of Air Quality Planning and Standards

BACKGROUND INFORMATION ON DEVELOPMENT OF NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS: ASBESTOS, BERYLLIUM, AND MERCURY. *APTD-1503, 100p., March 1973. 135 refs. (This document is identical to APTIC 55189 in which the NTIS number was cited incorrectly. The correct NTIS number appears in this citation.)*

NTIS: 222802/1

The preamble to the National Emission Standards for Hazardous Air Pollutants (asbestos, beryllium, and mercury) sets forth: the bases for the Administrator s determination that asbestos, beryllium, and mercury are hazardous; the derivations of the final standards promulgated; the EPA s response to the significant comments received; and the principal revisions to the proposed standards. A more detailed discussion of the statements made in the preamble is presented. A section on general provisions discusses the applicability of the standards, approval for construction or modification, notification of startup, waiver of compliance, source reporting, and source sampling and analytical methods. Each of the three hazardous materials is then discussed in terms of health effects, development of the standard, evaluation of comments, environmental impact, and economic impact.

46193 APTIC NO. 68297

Dept. of Health, Education, and Welfare, Washington, D. C., National Inst. for Occupational Safety and Health

CRITERIA DOCUMENT: RECOMMEN ATIONS FOR AN OCCUPATIONAL EXPOSURE STANDARD FOR INORGANIC ARSENIC. *112p., 1973. 87 refs.*

GPO

A National Institute for Occupational Safety and Health criteria document on inorganic arsenic is presented. Inorganic arsenic is defined as elemental arsenic and all of its inorganic compounds except arsine and lead arsenate. Exposure to arsenic is defined as exposure above 0.01 mg As/cu m. The recommended workplace air standard for inorganic arsenic is 0.05 mg As/cu m of air determined as a time-weighted average exposure for up to a 10-hour work day, 40-hour week. Other recommendations presented in the criteria document concern the following areas: medical examination, labeling, personal protective equipment and work clothing, dissemination of hazard information to employees, work practices, sanitation practices, and monitoring and recordkeeping. The document also reviews the biologic effects of exposure, measurement methods and biologic evaluation, and the bases for previous standards and the currently recommended standard. Inorganic arsenicals appear to be more toxic than the organic forms, with trivalent As being more toxic than pentavalent As.

46194 APTIC NO. 68880

Illinois Inst. for Environmental Quality, Chicago, Ill., Environmental Health Resource Center

HEALTH EFFECTS AND RECOMMENDATIONS FOR ATMOSPHERIC LEAD, CADMIUM, MERCURY, AND ASBESTOS (FINAL REPORT). *Proj. 10.006, Rept. IIEQ 73-2, 107p., March 1973. 360 refs.*

NTIS: PB 220224

Recommendations are given for ambient air quality standards for lead, cadmium, mercury, and asbestos, based on human health criteria. Background information is given supporting these recommendations. The ambient air quality standards recommended are: 1.5 micrograms/cu m for lead, based on a 24-hour average sample that is applied at any given time and at any given point source; and 0.05 micrograms/cu m for cadmium, 0.3 micrograms mercury vapor/cu m, and 1000 asbestos fibers/cu m, all based on a 24-hour average sample. (Author abstract)

1972

46195 APTIC NO. 68913

Schulte, Harry F.

THE SIGNIFICANCE OF FEDERAL AND STATE AIR POLLUTION STANDARDS. *Atomic Energy Commission, Div. of Operational Safety, Proc. AEC Pollut. Contr. Conf., Oak Ridge, Tenn., 1972, p. 29-42. 9 refs. (Oct. 25-27.)*

NTIS: CONF-721030

The history and significance of Federal and State air pollution standards are discussed. The first standards developed under the Clean Air Act were ambient air quality standards which define the maximum concentrations of certain materials that can be accepted in the air to which the general population is exposed. The Environmental Protection Agency has promulgated national ambient air quality standards for a variety of substances including total particulates, sulfur oxides, nitrogen oxides, carbon monoxide, hydrocarbons, and photochemical oxidants. States are establishing implementation plans to meet these standards. Emission standards define the amount of material that may be emitted from an installation without exceeding ambient standards. They may vary somewhat from one community to another depending on meteorological conditions and the number of sources in the community. Federal emission standards have been established for automobiles, fossil-fueled steam generators, incinerators, cement plants, and nitric and sulfuric acid plants. The EPA has also proposed standards for asbestos, beryllium, and mercury. Occupational standards and threshold limit values have also been established. Occupational and ambient standards can differ and should be established independently.

1971

46196 APTIC NO. 68737

Rondia, D.

THE ROLE OF STANDARDS IN AIR POLLUTION PREVENTION POLICY. *(La place des normes dans une politique d assainissement de l air). Text in French. Ann. Gembloux, 77(2):135-146, 1971.*

The establishment of Belgian national air pollution prevention standards, including legal, personnel, and methodological aspects are discussed. Four levels of pollutant toxicity are defined with respect to their effect on the human organism: no effect; irritation of organs; visible changes followed by chronic diseases or premature death; and severe disease or premature death of the most vulnerable groups of the population. Standards are necessary to determine the nature and importance of air pollution effects on man and environment. Also numerical guidelines are necessary, such as quantitative values for concentration and duration of exposure. Israeli, West German, Dutch, and American standards for various pollutants are mentioned. The establishing of national standards is a complex task. It must be based on the education of the public who must be sensitized to the problem. Technical education should not only include law enforcement officials and workers, but also workers in all industrial fields. The W.H.O. feels that air pollution prevention programs should be carried out by special ministries or by special departments for the conservation of nature.

LEGAL AND ADMINISTRATIVE

1974

46197 **APTIC NO. 68747**

Babcock, L. R., Jr., N. L. Nagda, and A. T. Rossano

INTEGRATED ASSESSMENT OF HEALTH EFFECTS OF AIR POLLUTION. *Preprint, 6p., 1974. 7 refs. (Presented at the International Symposium on Recent Advances in the Assessment of the Health Effects of Environmental Pollution, Paris, France, June 24-28, 1974.)*

A comprehensive methodology for assigning air quality management priorities is presented which relates population exposure and health-related damage back to individual emission sources. The system will be used to rank source severities and will enable improvement of the experimental design of health effect studies. A simulation named popex is described which integrates earlier air quality index concepts with population exposure considerations. The prime purpose of most air quality management strategies to reduce the health risk to exposure human populations. A quantitative framework is needed which considers both the costs of improving air quality as well as health and other damages associated with pollution exposure. More studies are needed of the costs of health damages due to air pollution and of exact pollutant concentrations received by human receptors as a function of time. The popex model attempts to integrate population exposure parameters and toxicity of pollutants to arrive at a system for hazard-based ranking of sources. Considerable revision, extension, and verification will be required before popex can become a meaningful policy-making tool. (Author summary modified)

46198 **APTIC NO. 69098**

Billings, Leon

OVERVIEW DISCUSSIONS – FRIDAY, APRIL 19, 1974. *Preprint, National Inst. of Health, Research Triangle Park, N. C., National Inst. of Environmental Health Sciences and Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Development, 5p., 1974. (Presented at the Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Durham, N. C., April 16-19, 1974.)*

Legislation which affects the use of catalytic emission controls for automobiles is reviewed. The 1975 interim standards have been extended for 1 year to provide an opportunity to study the implications of catalysts. Several studies are being undertaken to provide additional information for the Congress so that it can make final recommendations regarding the use of catalysts. Oversight hearings are being conducted to evaluate various implications of the Clean Air Act. Several alternatives are described which might result if the worse fears of the scientific community regarding sulfate emissions from catalytic converters are realized.

46199 **APTIC NO. 68297**

Copeland, John O.

FEDERAL PERSPECTIVES ON ODOR CONTROL. *Ann. N. Y. Acad. Sci., vol. 237:315-319, Sept. 27, 1974. (Presented at the American Society of Heating, Refrigerating, and Air Conditioning Engineers and Air Pollution Control Association Conference, Odors: Evaluation, Utilization, and Control, Oct. 1-3, 1973.)*

Federal, state, and local involvement in the control of odors is discussed based on federal legislation. The Clean Air Act Amendments of 1970 provides all the authority necessary to ensure proper odorous air pollution control. This is accomplished by national ambient air quality standards (NAAQS), performance standards for new stationary sources (NSPS) of air pollution, the classification of odorants as hazardous air pollutants, air pollution control is prescribed interstate and intrastate air pollution situations, and motor vehicle and aircraft air pollution control. The Act encourages State and local governments to assume primary responsibility for control. The manpower resources available at all levels is limited. The NSPS provides for a separate avenue for control of odors. Sources cin be selected and studied on an individual priority basis commensurate with available manpower resources.

46200 **APTIC NO. 68334**

Cross, Frank L., Jr. and Glenn E. Benson

THE REALISM OF SIGNIFICANT AIR QUALITY DEGRADATION. *Louisville Univ., Speed Scientific School, Ky.; International Assoc. for Pollution Control; American Chemical Society, Washington, D. C.; American Inst. of Chemical Engineers, New York; American Inst. of Industrial Engineers, New York; American Society of Civil Engineers, New York; American Society of Mechanical Engineers, New York; and Water Pollution Control Assoc., Environ. Eng. Sci. Conf., Annu. Meet., Louisville, Ky., 1974, p. 159-175. (March 4-5.)*

The Environmental Protection Agency s use of nondegradation concepts when it develops guidelines for evaluating regional development and the location of new point sources is discussed. A proposed plan that will define and prevent significant air quality deterioration is described. The plan is the Air Quality Increment Plan, which is based upon specific allowable increments to be added to the baseline air quality concentrations. The proposed increments are 10 micrograms/cu m annual average and 30 micrograms/cu m 24-hour average for particulates and 15 micrograms/cu m annual average and 100 micrograms/cu m 24-hour average for sulfur dioxide. The evaluation technique for nondegradation, air quality diffusion modeling, case histories, and future trends are discussed. The proposed guidelines for nondegradation appear to be very realistic. Case studies on major/minor sources of emissions reveal that predicted ground level concentrations are compatible with the nondegradation criteria, provided that the plants comply with existing national performance standards and state regulations and that existing ambient air quality levels are close to or below the secondary air quality standards. Future trends indicate that new sources wishing to locate in areas having very low ambient air pollutant concentration levels may be restricted and may have to select another area. (Author summary modified)

46201 **APTIC NO. 69101**

Epstein, Samuel S.

OVERVIEW DISCUSSIONS -- FRIDAY, APRIL 19, 1974. *Preprint, National Inst. of Health, Research Triangle Park, N. C., National Inst. of Environmental Health Sciences and Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Development, 15p., 1974. (Presented at the Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Durham, N. C., April 16-19, 1974.)*

An overview of the public interest position regarding the impact of automobile emission controls is presented. The restricted availability of information necessary to the decision-making process is a critical issue. There is a growing consensus that much data currently submitted by the automobile and related industries to the Environmental Protection Agency are highly selected and geared to narrowly defined short-term corporate interests. The relationship between the catalyst manufacturers and the automobile industry is discussed as an example of the restriction of data on automobile emissions. The public image of the automobile industry is discussed based on several examples of conspiracy, illegal acts, distortion, manipulation, and monopolistic practices. The public view of catalytic converters is presented. Some public interest recommendations are made regarding access to data, public interest representation in decision-making processes, the need for expanded and independent research, and the need for increased Environmental Protection Agency appropriations.

46202 **APTIC NO. 69080**

Finklea, John F.

THE SHADOW KNOWS BUT NOBODY ELSE DOES. *Preprint, National Inst. of Health, Research Triangle Park, N. C., National Inst. of Environmental Health Sciences and Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Development, 3p., 1974. (Presented at the Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Durham, N. C., April 16-19, 1974.)*

Technical information of importance to public health, environmental protection, and economic well being should be made more readily available to the public, industry, and government if society is to function for the common good. Hidden information will only serve narrow interests and in the long run may not serve even those interests well. Society presently does not have adequate access to the information gathered by the Federal government and automobile companies on air pollution.

46203 **APTIC NO. 69059**

Hishida, Kazuo

THE NEW AIR REGULATIONS FOR TOKYO. *(Tokyo-to no atarashii taiki kisei). Text in Japanese. Kagaku Kojo (Chem. Factory), 18(7):2-5, July 1974.*

The specific control programs for the Metropolitan Tokyo for attaining the new environmental standards are discussed. For controlling sulfur dioxide emissions from fixed sources, a 15% reduction of fuel consumption from that of 1973 will be enforced for 1974. Previous enforcements of fuel regulations have never led to improvement and therefore more stringent emission regulations will be enforced in 1974. All factories consuming more than 3000 l/day of fuel oil will be requested to complete the installation of boiler stack gas desulfurization systems by 1977. The number of factories affected as of 1972 was 315 and the plan should reduce sulfur oxides emission by 390,000 tons by 1977. For newly constructed buildings (especially for those with more than 50,000 sq m area), heat source conversion will be requested. To data, 162 factories changed from oil to gas, and 52 to electricity. Fuel conversion from coal to oil for power generation boilers should reduce SOx by 1000 tons/year by 1977. In congested building areas, local heating and cooling systems will be planned and promoted. Other plans such as designation of fuel consumption control areas, factory site limitations and relocation plans, subsidies and loans, and pollution control agreements with industries are discussed. Nitrogen dioxide will be controlled by establishing emission standards, by installation of 90% denitrification systems for factories with more than 3000 l/day fuel consumption, by regulating small boilers to emit 80 ppm of nitrogen oxides maximum, and by reducing 50% of all NOx emissions for metal heating, ceramic, drying, and incineration furnaces. By 1977, a 68% reduction of emission will be achieved. When the presently constructed local heating and cooling systems are completed, the total winter NOx emission is expected to be decreased by 38.2%. In addition, specific programs for reduction of hydrocarbons, dusts and suspended particulates, lead, cadmium, and toxic gases are discussed.

46204 **APTIC NO. 68398**

Holston, Richard M. and Bernard J. Schroer

EVALUATING THE IMPACT OF NEW INDUSTRY ON A CITY S PARTICULATE LEVELS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1974. 3 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., 1974.)*

An urban diffusion model known as the Air Quality Display Model (AQDM) was used to determine the impact of locating new industry in two industrial parks on particulate dispersion in the Huntsville, Alabama area. Source area, meteorological data, and receptor data were used as input; and the primary output of the model was the computed ground level concentration at each of the grid and non-grid receptors. The model was run with a number of increase emission estimates at each of the two industrial parks to study the impact of new industry on particulate concentrations. Stack heights were assumed to be zero; therefore, the emissions were not dispersed over a wide area. The maximum particulate emissions from both parks acceptable in terms of not exceeding the annual federal standard of 75 micrograms/cu m were estimated at a total of 40 tons. The maximum 24-hour concentration necessary for emissions to reach 40 tons from both parks was estimated to be 160 micrograms/cu m. Subsequent programming modifications incorporated into the model included the addition of wind rose data for four major metropolitan areas in the state and the addition of an optional method of computing the plume rise using the Brigg s equation.

46205 **APTIC NO. 66415**

Inoue, Ichiro

NOX REGULATIONS AND THE FUTURE PROJECTS. *(NOx no kisei to kongo no kadai). Text in Japanese. Preprint, Japan Assoc. for Thermal Energy Technology, Tokyo (Japan), p. 15-17, 1974. (Presented at the Heat Management Conference, Tokyo, Japan, June 28-29, 1974.)*

The environmental standard for nitrogen oxides (nitrogen dioxide) was finally established on May 8, 1973 after some years of study. The maximum allowable concentration is less than 0.02 ppm (daily average), and the regulation measurement method is spectrophotometry using the Saltzman reagent. The immediate goal is to achieve the standard for 60% of days per year. Emission sources of NOx can be boilers, industrial furnaces, installations using nitric acid, and automobiles, and each source must be controlled by its own method and standard. For automobiles, as of April 1973, the maximum allowable emission is 2.18 g per 1 km, which is about 70% of the NOx emission quantity of present cars. The standard is expected to become 0.25 g/km. The present environmental concentration of NOx is about three times the daily standard of 0.02 ppm. The consumption of fuel is increasing by 10% every year and will grow by 200% in 8 years. This means the present emission quantity in all sources must be less than 1/6 by 1981.

46206 **APTIC NO. 69040**

Inoue, Ichiro

FUTURE PROJECTS FOR AIR POLLUTION CONTROL. *(Kongo no taiki osen taisaku no kadai). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 10(7):1927-1934, July 1974. 12 refs.*

The status of pollution and pollution control in Japan is reviewed. In recent years, there has been a downturn in the concentrations of atmospheric dust, sulfur dioxide, and carbon monoxide. There seems to be some increase in nitrogen dioxide and hydrocarbon in the atmosphere. The downturn in CO concentration is attributable to the effectiveness of automobile exhaust gas regulations. The decrease in SO2 is due to effective action concerning sulfur oxides, such as high smokestacks and desulfurization processes. The SO2 standards were stiffened in May 1973 to reach a daily average of 0.04 ppm. Continued desulfurization alone will not be enough to meet the new standards. Other means should be considered, such as use of natural gas as fuel, or subsidization of smaller concerns by larger conglomerates to guarantee sufficient supplies of low-sulfur fuel for all. The successful control of sulfur pollution up to now should give positive impetus to control of nitrogen oxides, HC, and atmospheric dust. Emission standards enforced by legal action are a last resort. Cooperative guidelines and step-by-step planning that fit the regional needs are necessities. A central data bank that can furnish pollution information to those faced with its control is visualized.

46207 **APTIC NO. 68511**

Jingi, Y. and M. Teraishi

SYSTEM ENGINEERING APPROACH TO AIR POLLUTION CONTROL. *(Taiki osen seigyo ni taisuru sisutemu kogakuteki sekkinho). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, p. 1-14, 1974. 26 refs. (Presented at the Japan Society of Mechanical Engineers Special Meeting on Air Pollution Control by Electric Computer, Okayama, Japan, July 5, 1974.)*

The necessity for a total evaluation standard for global pollution taking into consideration the type of pollutant, location of pollutant source, meteorological factors, the large-scale socio-economic system, and human activity is discussed. The type, characteristics, and sources of primary and secondary gaseous and solid pollutants are described. The basic theory of atmospheric pollutant diffusion is reviewed and diffusion equations are given. The prediction models for pollutant concentration are described with examples of the Gaussian plume model, puff model, box type model and statistical model. The concept of system engineering approach to air pollution control is discussed with reference to environmental capacity, optimum long-range control policies for air pollution and worldwide system for air pollution control.

46208 **APTIC NO. 69129**

Jones, Charles

FEDERAL AIR POLLUTION POLICY. SOME THOUGHTS ON EFFECTS AND FEEDBACKS. *Resources, 1974:18-24, Winter 1974. 9 refs.*

Federal air pollution policy is reviewed in terms of its characteristics, effects, and feedbacks. Federal policy has been based on protecting public health, though a subtle but important shift in purpose characterizes the Clean Air Amendments of 1970 where the emphasis is on obtaining the cleanest air possible. The effects of such policies are leading to questions involving the problem of solid waste disposal (fly ash and other captured pollutants) and neighborhood trash disposal problems resulting from the cessation of open burning. Recycling research is needed since industrial processes are not well designed to recycle without prohibitive processing and production costs. Aside from raising questions involving solid waste disposal, Federal air pollution policy is also resulting in government expansion, reordering of financial priorities, increased taxes for the public, shifts in public relations approaches by industry, and citizen involvement. Speculated feedbacks resulting from such policies include: integration of environmental control programs, adaptation of Federal programs to state and local conditions, greater emphasis on design engineering of control devices, incentives such as tax write-offs for development and installation of control equipment, support for greater citizen group participation in local advisory committees, continued research on the health effects of pollutants, and rigid national ambient and emissions standards as well as limited state and local discretion resulting from citizen feedback to the federal government.

46209 **APTIC NO. [illegible]**

Jones, Charles O.

SPECULATIVE AUGMENTATION IN FEDERAL AIR POLLUTION POLICY-MAKING. *J. Polit., vol. 36:438-464, 1974. 34 refs.*

Federal air pollution policy is discussed. A more or less traditional majority-building incrementalist model adequately explains the policy department before 1970. Because of the dramatic surge in public concern for and interest in environmental issues, generalizations based on the model are now less durable. An alternative public satisfying-speculative augmentation model of policy development is described. The processes of policy development for each model are compared by examining the characteristics of the issue-area itself, the institutional units responsible for action, decision-making, and the resulting policies. Some of the broader implications of the second model are considered. Since the public may know what they want but not have the knowledge of realistic alternatives (given scientific, technological, and economic realities), satisfying the public may create costs and make demands which cannot be reasonably met. (Author introduction modified)

46210 **APTIC NO. 68691**

Kachi, Shin

KEIYO INDUSTRIAL BELT - ITS CONSTRUCTION AND AIR POLLUTION COUNTERMEASURES. *(Keiyo kogyo chitai - sono zosei to taiki osen taisaku o megutte). Text in Japanese. Taiki Osen Nyusu (J. Japan. Soc. Air Pollution), no. 84:2-9, Sept. 1974.*

Between 1950 and 1973, the landfill programs around the Tokyo Bay, consisting of the Tokyo-Chiba industrial belt, were escalated rapidly, creating serious industrial pollution. From about 1957, dust collection equipment was installed at various industries which emitted visible black or red dusts. Around that time, the plants of Chiba city began to show the effects of red dusts from the red smoke of open hearth furnaces. All the blame was placed on these visible smokes, and the damage from invisible pollutants such as sulfur dioxide was ignored. In 1959, six each of lead dioxide type SO2 meters and settling dust counters were installed in the Chiba area. And in 1963, five monitoring stations in Chiba and five in Ichihara were established, and for the first time the basis of a monitoring network was placed in the much needed area. Utilizing the newly landfilled areas, between 1958 and 1965, numerous industries including glass manufacturing, petroleum refining and petrochemicals, ink manufacturing, thermal power plants, and fertilizer manufacturing constructed their plants. In the next three years, the measurement of SO2 by the PbO2 method increased three times; steam, dusts, ammonia, fluoride, and chloride were all mingled and created extremely poor visiblity and damage to trees in the area. But industries continued to construct new plants. Finally, a strong opposition by the residents of the area began. The first case was the fuel desulfurization plant, then a petroleum plant and a chemical plant which had been already boycotted in other areas of Japan were forced out. From November 1968 in about a year and half, about 40 companies in the area joined in an agreement of voluntary pollution control. Collectivization of high stacks was one way of solving the problem. The SO2 problem in the Ichihara area was improved with the worst peak in 1968-69. Paralleling with these countermeasures, in newly landfilled areas contiguous to the industrial belt, a buffer zone of non-polluting emission industries were built, and green areas and parks were created. In south Chiba, however, where a buffer area is most needed, there is no room for creating even a buffer zone. Further improvements for lowering the SO2 level and the new problem of Nitrogen oxides are in the future program.

46211 **APTIC NO. 68673**

Katayama, Toru

ENVIRONMENTAL ASSESSMENT IN ENVIRONMENTAL ADMINISTRATION. *(Kankyo Gyosei ni okeru*

Kankyo Assessmento ni tsuite). Text in Japanese. Denki Kyokai Zasshi (J. Japan Elec. Assoc.), no. 611:24-33, Sept. 1974.

The Environmental Investigation Department was established in the Environment Agency in July 1974 for organized environmental assessment administration. The new Tomakomai East Industrial Base, Mutsu Ogawahara Development, and others are the objects for environmental assessment, and the task of environmental administration is changing from control of existing pollution to prevention at the planning and development stages. The significance of environmental assessment and administrative background for environmental assessment are discussed. The intermediate report of the Central Pollution Control Committee Control Planning Meeting held on June 24, 1974 is summarized. The guidelines for environmental effect evaluation given by Central Pollution Control Committee Control Planning Environmental Effect Evaluation Subcommittee are described. The topics covered are the significance of environmental effect evaluation and environmental effect evaluation and environmental conservation standards, data processing of basic information, and estimation of environmental effect.

46212 APTIC NO. 68825

King, Francis J.

THE AIR POLLUTION TRAINING-INSTITUTE: GOALS, OBJECTIVES, AND ACCOMPLISHMENTS. *Louisville Univ., Speed Scientific School, Ky.; International Assoc. for Pollution Control; American Chemical Society, Washington, D. C.; American Inst. of Chemical Engineers, New York; American Inst. of Industrial Engineers, New York; American Society of Civil Engineers, New York; American Society of Mechanical Engineers, New York; American Water Works Assoc., New York; Inst. of Electrical and Electronic Engineers, New York; and Water Pollution Control Assoc., Environ. Eng. Sci. Conf., Annu. Meet., Louisville, Ky., 1974, p. 195-204. (March 4-5.)*

The Air Pollution Training Institute located in the National Environmental Research Center at Research Triangle Park, N. C. is described. Physical facilities include three modern classrooms and an auditorium equipped for utilization of all training aids; a television studio providing facility for production of color and black and white TV training segments; two large general purpose laboratories, and eight smaller special labs. Staff and faculty offices are located on the floor above the laboratories. The staff consists of 29 permanent positions and two meteorologists on temporary assignment. The student enrollment is described with respect to professional experience, degrees, professions, and employers. The courses are divided into eight subject areas: types, sources, and effects of air pollution; meteorology, surveillance, and sampling; testing of air pollution sources; analysis of air pollutants; handling of air pollution data; air pollution control measures and control devices; legal and legislative aspects of air pollution control; and air pollutions control agency administration. The goals, objectives, and accomplishments of the institute are described. The institute has demonstrated the capability of delivering quality programs of training, has provided leadership in the field, and has the personnel and the capability to grow and meet future challenges.

46213 APTIC NO. 68995

Kuelske, S. and H. W. Lohse

SMOG ALARM SYSTEM OF NORTHRHINE WESTPHALIA WITH A DESCRIPTION OF THE TELEMETRIC NETWORK. *(Der Smogwarndienst des Landes Nordrhein-Westfalen mit einer Beschreibung des telemetrischen Messsystems). Text in German. Angew. Inf., no. 9:377-386, Sept. 1974. 6 refs.*

The smog alarm system of Northrhine Westphalia, established in 1963-1965, is described. The monitoring system, composed of 13 sampling stations, measures the concentrations of sulfur dioxide as an indicator substance. The criteria of the smog alarm have been made stricter since 1972-1973 when a first-degree alarm was defined as a situation in which at least two of the total of 13 sampling stations have a permanent reading of 1 mg SO2/cu m for at least 3 hr., and when there are chances of a second degree alarm within 24 hr. The second degree smog alarm is now defined as a situation in which at least two sampling stations have a permanent reading corresponding to 2 mg/cu m SO2 concentration for at least 3 hr., and when the unfavorable meteorological conditions are predicted to prevail for over 24 hr. The measuring stations equipped with Hartmann-Braun type Picoflux SO2 monitors are connected to a central on-line computer via dedicated telephone lines. Each monitor sends its measurement data to the central data-processing computer once every minute.

46214 APTIC NO. 68896

Meijer Drees, F. J.

LEGAL PROBLEMS OF AIR POLLUTION STANDARDS. *(Juridische problemen rond grenswaarden voor luchtverontreiniging). Text in Dutch. Ingenieur, 86(26):520-527, June 1974. 43 refs.*

Legal problems of emission and air pollutant concentration standards are discussed with respect to the different levels of the effects of air pollutants on human, animal and plant lives. Air pollution is defined as a factor interfering with the physical or psychic health of humans, and causing damages to animals, plants, and dead matter. The maximum allowable pollutant concentrations can only be set in cooperation with physicians, chemists, biologists, toxicologists, and meteorologists. The specific concentration should be set with respect to the populations at risk, i.e., the most sensitive subjects. Thus, the maximum allowable carbon monoxide concentrations should consider the effects of this gas on the human body, while the fluorine concentration should be standardized for the most sensitive plants and herbivorous animals. The limit values to be established for air pollutants should be between the hazardous and the no-effect levels. Air pollution standards should be regarded only as auxiliary means in fighting air pollution, while the main emphasis should lie on actual emission and pollution control methods.

46215 APTIC NO. 68955

Nakata, Eiichi

EVALUATION TESTS FOR MOTOR VEHICLE SAFETY AND POLLUTION PREVENTION DEVICES. *(Jidosha anzen kogai boshi sochi no hyoka shiken). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 28(9):771-775, Sept. 1974.*

Carbon monoxide discharged from gasoline vehicles or Liquid Petroleum Gas-operated vehicles in a state of driving has been regulated since 1966, while CO discharged from vehicles in a state of idling was regulated in 1970 for the first time. The outline of equipment models which are designated or authorized as compulsory is mentioned. Regulations aimed at reducing hydrocarbons and nitrogen oxides were enforced in Nov., 1972 as an urgent step to prevent photochemical smog. They made it obligatory to equip vehicles with equipment to reduce exhaust gas. A building with facilities to conduct evaluation tests of equipment for prevention of public hazard from exhaust gas was completed recently. The facilities include a chassis dynamometer, equipment to sample exhaust gas by means of dilution, an analyzer of exhaust gas, and equipment to process data on exhaust gas.

46216 APTIC NO. 64300

Overbey, J. W. II and R. P. Ouellette

THE DESIGN AND OPERATION OF THE NATIONAL AEROMETRIC DATA BANK. *In: Statistical and Mathematical Aspects of Pollution Problems. John W. Pratt (ed.), New York, Marcel Dekker, 1974, Chapt. 4, p. 39-62. 5 refs.*

A National Aerometric Data Bank was built to assemble at a single location the aerometric data from such Federal programs as the Continuous Air Monitoring Program and the National Air Surveillance Networks and from the surveillance programs of state and local agencies. An integral part of the activity of collecting and analyzing air quality data is the development of a standardized, centralized data storage and information retrieval system designed to maintain efficiently the ever increasing amount of data available. The system operation, data editing and validation, and data analysis are discussed. Some statistical applications of the data bank are an air quality diffusion model, air pollution abatement for stationary sources, trend surface analysis, and principal components analysis. These types of analyses are discussed as examples of the kinds of studies that are possible with the data bank.

46217 **APTIC NO. 68831**

Panagiotakopoulos, Demetrios

A FRAMEWORK FOR ENVIRONMENTAL PLANNING IN NEW TOWNS. *Louisville Univ., Speed Scientific School, Ky.; International Assoc. for Pollution Control; American Chemical Society, Washington, D. C.; American Inst. of Chemical Engineers, New York; American Inst. of Industrial Engineers, New York; American Society of Civil Engineers, New York; American Society of Mechanical Engineers, New York; American Water Works Assoc., New York; Inst. of Electrical and Electronic Engineers, New York; and Water Pollution Control Assoc., Environ. Eng. Sci. Conf., Annu. Meet., Louisville, Ky., 1974, p. 59-77. 7 refs. (March 4-5.)*

A methodology is described for environmental planning in new towns based on the environmental capacity of a site to sustain a town and the trade-offs among environmental quality, population level, economic growth, and town plan. A model is presented for new town development, and a hypothetical case is presented. The model takes into account the interrelationships among the various forms of the environment, balances the demands for the absorbing capacities of these forms, and suggests an efficient and systematic search for the many alternatives for managing the overall environmental absorbing capacity of a site.

46218 **APTIC NO. 66295**

Prerau, David S. and Paul J. Downey

THE TRANSPORTATION AIR POLLUTION STUDIES (TAPS) SYSTEM (INTERIM REPORT). *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Work Unit R-3539/OS-332, Rept. DOT-TSC-OST-73-24, 121p., March 1974.*

NTIS: PB 230919

The Transportation Air Pollution Studies (TAPS) Data Base is described along with the software system developed in association with it. The TAPS system is a package of computer programs for storing, manipulating, and retrieving both highway and airport air pollution data, including emissions, meteorological and other data, which are required for the Transportation Systems Center s model validation program. The system also contains routines for analyzing the performance of dispersion models as well as programs to generate both tabular and graphical output. Users guides for both the storage and retrieval programs of the TAPS system are included along with examples of how these programs might be used. Complete listings are given for the TAPS system. (Author abstract modified)

46219 **APTIC NO. 68296**

Prokop, William H.

STATUS OF REGULATIONS FOR SOURCE EMISSION AND AMBIENT ODORS. *Ann. N. Y. Acad. Sci., vol. 237:288-308, Sept. 27, 1974. 38 refs. (Presented at the American Society of Heating, Refrigerating, and Air Conditioning Engineers and Air Pollution Control Association Conference, Odors: Evaluation, Utilization, and Control, Oct. 1-3, 1973.)*

The status of regulations for source emission and ambient odors is discussed based on a survey of state, county, and municipal regulations. The regulations are tabulated for all states and certain selected local authorities based on the uniqueness of their regulations. Those state regulatory authorities who have no odor regulations normally have an ordinance prohibiting emission of air contaminants that are objectionable bu do not specifically include odors. The other states have at least an odor nuisance ordinance and/or a regulation specifying odor level in the ambinet air or in a source emission and/or an incineration standard. Certain states and local authorities have a combination of ambient air and source emission standards. Minnesota is the only regulatory authority that specifies a total odor emission rate, which is set a 1 million odor units/min. This limitation places a severe restriction upon wet scrubbers and other odor control systems that have been installed in rendering plants with capacities as high as 50,000 to 150,000 CFM. Specified odor sensory methods for determining compliance with the odor level limits are discussed including ASTM syringe, scentometer instrument, and the dynamic forced-choice triangle olfactometer.

46220 **APTIC NO. 68832**

Rosen, Stephen S.

THE COMPREHENSIVE AIR QUALITY STUDY FOR THE WEST SIDE HIGHWAY PROJECT IN N.Y.C. *Louisville Univ., Speed Scientific School, Ky.; International Assoc. for Pollution Control; American Chemical Society, Washington, D. C.; American Inst. of Chemical Engineers, New York; American Inst. of Industrial Engineers, New York; American Society of Civil Engineers, New York; American Society of Mechanical Engineers, New York; American Water Works Assoc., New York; Inst. of Electrical and Electronic Engineers, New York; and Water Pollution Control Assoc., Environ. Eng. Sci. Conf., Annu. Meet., Louisville, Ky., 1974, p. 95-107. 6 refs. (March 4-5.)*

Air quality studies performed for the West Side Highway project in New York City are discussed. The studies, which formed the basis for the environmental impact statement being written for the project, included a field measurement program, development and calibration of a pollutant transport model which accurately predicts pollutant concentrations for a variety a typical highway configurations, predictions of the impact of the project on both the local and regional air quality, and analysis and investigation of ameliorative measures to reduce adverse impacts. The study objectives, field measurement program, model, impact analysis, ameliorative measures, and the relationship of the project to the air quality implementation plan of New York City are discussed.

46221 **APTIC NO. 69038**

Sekiya, Osamu

KAWASAKI - THE PAIN OF AIR POLLUTION AND COUNTERMEASURES. *(Kawasaki-shi - taiki osen no kuno to taisaku). Text in Japanese. Ao to Midori (Blue Green), 3(7):44-51, July 1974.*

For a long time, the only major air pollutant was sulfur dioxide. When the environmental standard was 0.05 ppm, the average measurement in Kawasaki was 0.11 ppm in 1965 to 1967, and Kawasaki became known as one of the most polluted cities in Japan. The average gradually decreased to 0.08, 0.06, 0.05, and less than 0.05 for 1973. The final target is 0.012 ppm for 1976, and SO2 is no longer considered a major problem. The city s environmental protection department started out with one person in 1960; personnel increased to 11 in 1965, and to 27 in 1969; it became the Bureau of Pollution Control in 1971 with 75 staff members and the number increased to 121 in 1973. The Pollution Monitoring Center was established in 1971 simultaneously with the Bureau. It consists of an automatic pollutant monitoring system, air quality monitoring system, and an emission source SO2 gas monitoring system. The city has seven monitoring points and 42 factory monitoring points; the data from these locations are constantly sent to the central board by a telemeter and the data is analyzed. The three basic rules of the city are safety, health, welfare, and the protection of citizens rights. The frequency of photochemical smogs has increased every year since the initial smog of August 1970 in north Kawasaki. Alerts were issued 10 times in 1971, 21 times in 1972, and 25 times in 1973; nitrogen oxides control is very much needed. Seven artery highways pass through Kawasaki, and unless the enormous number of automobiles driving through the city is controlled, there is no way of controlling NOx.

46222 **APTIC NO. 69841**

Sekiya, Osamu

THE DISTRESS AND MEASURES OF AIR POLLUTION IN THE CASE OF KAWASAKI CITY. *(Kawasaki-shi-Taikiosen no kuno to taisaku). Text in Japanese. Ao to Midori (Blue Green), 3(7):44-51, July 1974.*

Kawasaki was heavily polluted by sulfuric acid gas in 1965, 1966 and 1967. The sulfurous acid gas concentration was 0.11 ppm is Oiso (Kawasaki) while the environmental standard for H2SO3 gas established by the Japanese government was then 0.05 ppm. Kawasaki made great efforts to wipe out its reputation as, the most heavily polluted area in the country by undertaking the elimination of H2SO3 gas. The result was reflected in the H2SO3 concentrations which were 0.08 in 1968, 0.06 in 1969, 0.06 in 1970, and 0.05 in 1972 respectively. Kawasaki has been engaged in carrying out steps against public hazard ahead of the Japanese government since its initial measurement of air pollutants in 1957 when there were cases of fig withering attributed to the dirty air. A public hazard control center was set up in 1971. It conducts collection and analysis of statistical data on air pollutants, monitoring of air pollution situations, and the control of sources discharging sulfuric acid gas.

46223 **APTIC NO. 69940**

Silvasi, John J. and Joseph J. Sableski

AN OVERVIEW OF ACTIVITIES DIRECTED TOWARD LONG-TERM MAINTENANCE OF AIR QUALITY STANDARDS (FINAL REPORT). *Office of Air and Waste Management, Research Triangle Park, N. C., Office of Air Quality Planning and Standards, Rept. EPA-450/2-74-016, 32p., Nov. 1974.*

The Environmental Protection Agency s program concerning long-term maintenance of the national air quality standards is discussed. Background information describes the historical development of and the rationale for the program. The legal requirements for states are presented, and EPA s guidance and assistance available to states are discussed. The consequences of the program include the application of various kinds of measures, consideration of the scheduling of the measures, and the need for intergovernmental coordination, public participation, and participation from special interest groups. The designation of Air Quality Maintenance Areas, 10-year plan development, indirect sources, air quality monitoring and new source evaluation guidelines, and control methods which may be employed are discussed. (Author abstract modified)

46224 **APTIC NO. 68830**

Sullivan, Thomas F. P.

ENVIRONMENTAL LAW FOR NON-LAWYERS. *Louisville Univ., Speed Scientific School, Ky.; International Assoc. for Pollution Control; American Chemical Society, Washington, D. C.; American Inst. of Chemical Engineers, New York; American Inst. of Industrial Engineers, New York; American Society of Civil Engineers, New York ; American Society of Mechanical Engineers, New York; American Water Works Assoc., New York; Inst. of Electrical and Electronic Engineers, New York; and Water Pollution Control Assoc., Environ. Eng. Sci. Conf., Annu. Meet., Louisville, Ky., 1974, p. 13-23. (March 4-5.)*

The legal concepts embodied in a book and course entitled Environmental Law for Non-Lawyers are presented. The three traditional fundamentals of environmental law are the concepts of nuisance, negligence, and trespass. The National Environmental Policy Act of 1969 is a landmark legislation in the environmental field which requires systematic consideration of the environmental impact of all major Federal activities. The Clean Air Act of 1970 set up a new system of air quality standards and called for a rollback of the automobile pollution level. Various aspects of the Act are discussed including primary and secondary air quality standards, interstate regions, implementation plans, national emission standards, new stationary sources, hazardous air pollutants, and automobile emission standards. Other legislation dealing with noise, water pollution, resource recovery and solid waste, and land use control are reviewed.

46225 **APTIC NO. 63854**

Ward, E. A., J. C. Elliott, E. J. Friedman, E. L. Riley, and S. Stryker

INVESTIGATION OF ENVIRONMENTAL INDICES FROM THE EARTH RESOURCES TECHNOLOGY SATELLITE (TYPE III FINAL REPORT). *MITRE Corp., McLean, Va., National Aeronautics and Space Administration Contract NAS 5-21842, Rept. PR 568/MMC 200, M74-37, 377p., Feb. 1974. 76 refs.*

Land use change, water quality, and air quality indices are calculated from analysis of Earth Resources Technology Satellite (ERTS) multispectral scanning imagery and computer compatible tapes. Specifications are developed and discussed for an ERTS environmental monitoring system which help to serve the information needs of environmental managers at the federal, state, regional, and local level. The ERTS data are very useful in land use mapping and for providing overall measures of air and water turbidity. More and better ground truth and possibly additional spacecraft sensors will be required if specific air and water pollutants are to be quantified from satellite data.

46226 **APTIC NO. 68385**

Office of Air and Waste Management, Research Triangle Park, N. C., Office of Air Quality Planning and Standards

GUIDELINES FOR AIR QUALITY MAINTENANCE PLANNING AND ANALYSIS. VOLUME 6: OVERFLOW OF AIR QUALITY MAINTENANCE AREA ANALYSIS (FINAL REPORT). *Program Element 2AC129, Rept. EPA-450/4-74-007, OAQPS 1.2-025, 43p., Sept. 1974. 15 refs.*

NTIS: PB 237584/AS

A description of all the major requirements for analyzing whether an area should be designated as one requiring an air quality maintenance plan and whether the plan is sufficient to meet designated air quality goals is presented. Topics covered include: emission inventories, the National Emission Data System, inventory projection, air quality measurement, the SAROAD (Storage and Retrieval of Aerometric Data) air quality data system, meteorological measurements, atmospheric simulation models, updating of data bases (emission inventories, air quality data, and meteorological data), estimates of current air quality, air quality projection, analysis of air quality maintenance plan formation, and analysis of proposed new sources.

46227 **APTIC NO. 68386**

Booz, Allen and Hamilton, Inc., Bethesda, Md.

GUIDELINES FOR AIR QUALITY MAINTENANCE PLANNING AND ANALYSIS. VOLUME 7: PROJECTING COUNTY EMISSIONS (FINAL REPORT). *Office of Air and Waste Management Contract 68-02-1005, Task*

4, Program Element 2AH137, Rept. EPA-450/4-74-008, OAQPS 1.2r026, 90p., Sept. 1974.

NTIS: PB 237 611/AS

A specific and uniform methodology is defined for upgrading existing emission inventories and for forecasting future emissions of air pollutants with small geographical areas (e.g., counties). The techniques provided are manual and are designed to be used by state and local air pollution control personnel in compiling baseline data for state plans to maintain National Ambient Air Quality Standards. All steps required to generate emission estimates are explicitly defined, and sources to be consulted for input data are specified. A completed set of forms and tables is provided for reference. Emission factor calculations are described for fuel combustion (point and area), industrial processes (point), transportation (area), solid waste disposal (point and area), and miscellaneous sources (point and area). Forecasts are limited to net pollutants discharged in the county and include efficiency of various pollution abatement devices, control regulations deadlines, and schedules of compliance for regulations. The updating of National Emissions Data System inventory data is also described.

46228 **APTIC NO. 68387**

Geomet, Inc., Rockville, Md.

GUIDELINES FOR AIR QUALITY MAINTENANCE PLANNING AND ANALYSIS. VOLUME 10: REVIEWING NEW STATIONARY SOURCES. *Office of Air and Waste Management Contract 68-02-1094, Task 2, Program Element 2AC129, Rept. EPA-450/4-74-011, EF 326, OAQPS 1.2-029, 88p., Sept. 1974. 48 refs.*

NTIS: PB 237 535/AS

Methods for assessing the impact of proposed point sources of pollution on maximum short term ambient concentrations and on annual mean ambient concentrations are presented for assisting air pollution control agencies in determining whether a proposed point source would be consistent with the need to maintain air quality within prescribed air quality levels. Topics covered in guidelines include: emissions and effectiveness of controls of point sources, stack characteristics, location and topography, merged parameters for multiple stacks, meteorological data, and methods for estimating pollutant concentrations for various emission situations.

46229 **APTIC NO. 68420**

Environmental Protection Service, Ottawa (Ontario), Air Pollution Control Directorate

CANADA S MOTOR VEHICLE POLLUTION CONTROL PROGRAM. *Policy and Planning Rept. EPS 2-AP-74-1, 51p, June 1974.*

The Canadian government, recognizing the need to improve the quality of the air, has launched a program to eliminate the motor vehicle as a significant source of air pollution in Canada. A general discussion of current government steps taken towards accomplishing this goal is given. Data and methodology now available for assessing and monitoring the Canadian automotive emission problem are summarized and evaluated, areas for further research are designated, and arguments are presented for the immediate need for stringent government action. Current programs for assessing the contribution of motor vehicles to air pollution in Canada include the Cold Weather Program, the Motor Vehicle Fleet Program, and a motor vehicle air pollutant inventory. The Motor Vehicle Safety Act, motor vehicle safety regulations and emission standards, and policy statements on automobile emissions are described and discussed. (Author abstract modified)

46230 **APTIC NO. 68424**

CONCAWE, The Hague (The Netherlands), Secretariat

STANDARD SPECIFICATIONS AND LEGAL LIMITS ON SULPHUR CONTENTS OF FUEL OILS. *In: Existing Environmental Regulations of Concern to the Oil Industry in Western Europe. Rept. 7/74, Nov. 1974, p. 1.1-1.9.*

Standard specifications and legal limits on sulfur contents of fuel oils are tabulated for individual countries or administrative areas in western Europe. Fuel oils are classified by viscosity into extra light, light, medium, heavy, and extra heavy. The limit on S content by wt% is tabulated when applicable for the five types of fuel oils and for gas oil. Data is given for Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and Great Britain.

46231 **APTIC NO. 68558**

FEDERAL LEGISLATION OFTEN UNREALISTIC. *Finish. Highlights, 6(5):22, July/Aug. 1974.*

Pollution may be defined as any unwanted or unrecoverable product coming out of a process and may be man-made or natural. Almost all painting processes depend upon the evaporation of a volatile liquid from the coating during application or afterwards. Such volatiles are predominantly organic solvents. Particulates are emitted to lesser degree, and if coatings are baked some reaction products may enter the atmosphere. Air pollution is the chief problem for the painting industry. The industry emits 1.5-3 million tons of organic emissions to the atmosphere yearly. The combination of oxides of nitrogen with organic materials resulting in formation of ozone and other oxidants in photochemical reaction is the big chemical problem. Federal legislation is often unrealistic. The Clean Air Act resulted in confusion because only stationary sources are controlled by the state, while the Federal regulations control automobile emissions. This resulted in two different approaches -- one controlling the photochemically reactive compounds and the other restricting emissions of all organic compounds. Industry is developing coating with less solvents and using new curing processes; however, these methods may exchange one set of pollution problems for another.

46232 **APTIC NO. 68611**

Federal Aviation Administration, Washington, D. C., Aircraft Safety and Noise Abatement Div.

ENGINEERING AND DEVELOPMENT PROGRAM PLAN–AIRCRAFT PROPULSION SYSTEMS FOR AIR POLLUTION. *Rept. FAA-ED-20-1, 36p., Feb. 1974. 1 ref.*

NTIS, DDC: AD 777484

A research program to control and reduce aircraft propulsion system air pollution is described. The program plan objectives, thy plan schedule, costs, program management, and pollution research needs are discussed. Aircraft pollution control standards are reviewed. The general objectives of the program are to develop measurement techniques, to develop engine emission reductions, to conduct general aviation emissions investigations and airport pollution investigations, to make advanced propulsion and support systems investigations, and to make operational impact assessments. Recommended funding for 1974- 1979 for various programs is listed.

1973

46233 **APTIC NO. 68886**

Atkisson, Arthur A.

PUBLIC POLICY ISSUES ASSOCIATED WITH CONTROL OF STATIONARY AIR POLLUTION SOURCES. *Triangle Universities Consortium on Air Pollution; Air Pollution Control Assoc., Pittsburgh, Pa.; American Lung Assoc.; American Petroleum Inst., Washington, D. C.; and North Carolina Univ., Chapel Hill, School of Public Health, Proc. Natl. Conf. Clean Air Act, Chapel Hill, N. C., 1973, p. 156-186. 28 refs. (Oct. 31-Nov. 2.)*

Major contemporary issues associated with Federal action to control stationary air pollution sources are identified. The effects of the Clean Air Act of 1970 and the issues associated with its implementation are examined through a focus on a postulated model of an air pollution problem-producing system and the several types of communities into which populated areas of the U. S. could be divided prior to the enactment of the Clean Air Act of 1970. (Author abstract)

46234 **APTIC NO. 69163**

Burton, Ellison S., Edward H. Pechan, III, and William Sanjour

A SURVEY OF AIR POLLUTION CONTROL MODELS. *In: Models for Environmental Pollution Control. Ann Arbor, Ann Arbor Science Publishers, 1973, Chapt. 11, p. 219-235. 3 refs.*

Computer-assisted simulation is the only analytical method available which can meet the requirements of a methodology for analysis of air pollution abatement practically. The general decision framework for air pollution control is described. The steps in the decision-making process are described including emission inventory, regional growth factors, regional cost data, meteorological data, demographic data, growth model, predicted inventory, control technologies and costs, alternative controls for each source, meteorological model, dose-response model, standards, compliance, regional and nonregional economic factors, economic impact, resultant cost and air quality, benefit model, and decision. The various model types which can be used to estimate costs and air quality are discussed including the Kohn St. Louis Model and the TRW Implementation Planning Program model. The TRW model consists of source data management, air pollutant concentration, source contribution file merge, control cost, control cost file update, emission standards, emissions standards file update, and regional strategies programs. Some of the results from using the modified Implementation Planning Program model to determine various strategies for the New York Air Quality Control Region are presented. Additional work with a micro model is outlined.

46235 **APTIC NO. 68884**

Campbell, William A.

AIR QUALITY STANDARDS. *Triangle Universities Consortium on Air Pollution; Air Pollution Control Assoc., Pittsburgh, Pa.; American Lung Assoc.; American Petroleum Inst., Washington, D. C.; and North Carolina Univ., Chapel Hill, School of Public Health, Proc. Natl. Conf. Clean Air Act, Chapel Hill, N. C., 1973, p. 122- 136. 9 refs. (Oct. 31-Nov. 2.)*

One of the major innovations of the Clean Air Act of 1970 is the imposition of national primary and secondary ambient air quality standards. The following four groups of legal and administrative issues related to those standards are discussed: the roles of the different levels of government; methods of setting standards; enforcement considerations; and nondeterioration questions. (Author abstract)

46236 **APTIC NO. 68885**

Chambers, Leslie A.

MOBILE SOURCE CONTROL. *Triangle Universities Consortium on Air Pollution; Air Pollution Control Assoc., Pittsburgh, Pa.; American Lung Assoc.; American Petroleum Inst., Washington, D. C.; and North Carolina Univ., Chapel Hill, School of Public Health, Proc. Natl. Conf. Clean Air Act, Chapel Hill, N. C., 1973, p. 137-155. (Oct. 31-Nov. 2.)*

The Clean Air Act places responsibility for regulation of automotive pollution on the Federal Government, with the exception of a permissive gesture in recognition of the standards already adopted in California. Enforcement is by state and local agencies; if local governments fail to develop and implement acceptable control plans, the Federal agency can impose its own strategies. Several provisions of Title II of the amended Act are reviewed and discussed.

46237 **APTIC NO. 68381**

Cleary, Graham

MEASUREMENT OF AIR POLLUTION IN URBAN AREAS: THE WHO INTERNATIONAL AIR MONITORING NETWORKS. *Preprint, World Meteorological Organization, Geneva (Switzerland) and World Health Organization, Geneva (Switzerland), p. 14-23, 1973. 1 ref. (Presented at the World Meteorological/World Health Organization Technical Conference on the Observation and Measurement of Atmospheric Pollution, Helsinki, Finland, July 30-Aug. 4, 1973.)*

The World Health Organization international air monitoring network program is described. The program aims to develop information systems to provide internationally comparable data on levels and and trends in air pollution through a network of reference centers and collaborating laboratories. There are provisions of assistance to governments in the establishment or strengthening of national air monitoring programs. Basic considerations on the duration and type of monitoring of air pollution are defined including the epidemiological basis for monitoring certain pollutants. Individual monographs will be prepared on the routine sampling and measurement of sulfur dioxide, suspended particulate matter, carbon monoxide, photochemical oxidants, and oxides of nitrogen.

46238 **APTIC NO. 68416**

Cote, W. A, J. E. Yocom, and N. E. Bowne

COLLECTION AND UTILIZATION OF ENVIRONMENTAL QUALITY DATA. *AIChE Symp. Ser., 70(136):31-39, 1973. 1 ref.*

The trend in environmental quality standards is toward tighter controls on the release of pollutants that degrade environmental quality. With higher control costs for tighter control, the expenditure of large sums of money hinges on the results of environmental quality measurement programs. Thus, the design and and execution of such programs and the evaluation and utilization of the data are coming under increased scrutiny by environmental control officials and process industry management. The factors to be considered when designing and carrying out environmental quality measurement programs to ensure that the results will provide a basis for making logical decisions on cost-effective approaches to environmental control actions are discussed. Case histories are given to show how the results of such programs are effectively applied. Types of environmental measurement programs which may be interrelated and complementary are the evaluation of source emissions, area or stream monitoring, and mathematical models. Program objectives, selection of equipment and methodology, sampling locations, sampling frequency and duration, measurement parameters, automated or manual equipment, laboratory requirements, data reduction, design of predictive or simulative models, project teams, coordination of measurements, communications and record-keeping, initial data evaluation, and utilization of collected data are discussed. (Author abstract modified)

46239 **APTIC NO. 68879**

Heath, Milton S., Jr. and Maynard M. Hufschmidt

STATE, FEDERAL AND LOCAL RESPONSIBILITIES UNDER THE CLEAN AIR ACT. *Triangle Universities Consortium on Air Pollution; Air Pollution Control Assoc., Pittsburgh, Pa.; American Lung Assoc.; American Petroleum Inst., Washington, D. C.; and North Carolina Univ., Chapel Hill, School of Public Health, Proc. Natl. Conf. Clean Air Act, Chapel Hill, N. C., 1973, p. 31-50. 24 refs. (Oct. 31-Nov. 2.)*

The Clean Air Act is evaluated as an exercise in intergovernmental relations. The Act is examined in the light of five models or tests: a structural test, a legal test, a systems test, a bargaining test, and a planning test. The Act is strongest in its legal and structural terms (though, structurally, not with respect to local government). It is weakest in its planning aspects and its linkages with other environmental systems. Persistent problems that cut across several of these categories are noted with respect to the land use and transportation planning provisions, the nondegradation clause, and some of the scheduling features of the Act. (Author abstract modified)

46240 **APTIC NO. 68734**

Mandelker, Daniel R. and Susan B. Rothschild

THE ROLE OF LAND-USE CONTROLS IN COMBATING AIR POLLUTION UNDER THE CLEAN AIR ACT OF 1970. *Ecol. Law. Q., 3(2):235-275, Spring 1973. 143 refs.*

While legislative attention to air pollution has largely been confined to the direct regulation of pollution sources, studies of air quality control long have recognized that land use planning and control are necessary to achieve and maintain clean air. Since 1970, the Federal Clean Air Act has authorized both land use and transportation controls as part of the state plans for implementing Federal air quality standards. The role that land use controls can play in achieving the air quality levels mandated by the Federal statute is reviewed, and the extent to which land use controls have been and are likely to be used for this purpose is considered. The regulatory system introduced by the 1970 Federal legislation is discussed with special attention to the role of land use controls prescribed in that act. Ways in which land use controls at the state and local level might be used as an air pollution control strategy are analyzed, and implementation of the Federal land use controls provision by the Environmental Protection Agency is discussed. The present role of land use controls in a Federal air pollution strategy is constrasted with other enacted and pending Federal statutes which require national land use policy implementation at state and local levels. A role for land use controls in regulating air pollution is suggested. (Author abstract modified)

46241 **APTIC NO. 68883**

Mandelker, Daniel R.

LAND USE AND TRANSPORTATION CONTROLS IN AIR POLLUTION PROGRAMS. *Triangle Universities Consortium on Air Pollution; Air Pollution Control Assoc., Pittsburgh, Pa.; American Lung Assoc.; American Petroleum Inst., Washington, D. C.; and North Carolina Univ., Chapel Hill, School of Public Health, Proc. Natl. Conf. Clean Air Act, Chapel Hill, N. C., 1973, p. 101-121. 4 refs. (Oct. 31-Nov. 2.)*

Air pollution control agencies are turning increasingly to land use and transportation controls as a principal strategy in air pollution abatement. Some of the problems which are raised by the exercise of such controls in air pollution programs are discussed. Additional statutory attention is needed to the legislative and administrative framework within which these controls are implemented. The political nature of most land use and planning decisions and the leverage problem are discussed. The problem of conflicting objectives and the pervasiveness of the land use issue are also described. The exercise of land use controls in the context of air pollution control programs will impose difficult problems in the choice of goals and strategies. The conflicting program objectives, choices between mutually exclusive policy alternatives, and the various trade-offs seem to require a statuatory mechanism considering these conflicts.

46242 **APTIC NO. 68507**

Matsuura, E. and I. Kobayashi

AUTHORIZATION SYSTEM FOR ENVIRONMENTAL POLLUTION DISEASE-NAGOYA- (PART 2). *(Kogaibyo nintei seido---Nagoya---(Dai-2-ho)). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 28(1):123, April 1973.*

The status of the Specified Respiratory Patients Medical Relief System established in February 1972 was analyzed. The sulfur oxides showed a general decreasing trend, and the number of days with a SOx concentration of less than 0.05 ppm was about 70%. The authorization system is practiced only in specified areas (with a population of about 150,000), and the number of certified patients increased linearly to 1606 in January 1973. The data on the patients were analyzed in regard to the specific respiratory diseases and age groups. At six medical centers, a total of 1081 cases were treated as of January 29, 1973. The inadequacy of the present environmental standards for maintaining healthy living environment, inadequacy of the authorization system, lack of cooperation by physicians and inefficiency of Environmental Control Committee are discussed.

46243 **APTIC NO. 68882**

Plager, Sheldon J.

PUBLIC HEARINGS UNDER THE CLEAN AIR ACT: ADMINISTRATIVE CRUCIBLE OR POLLUTERS PLOY. *Triangle Universities Consortium on Air Pollution; Air Pollution Control Assoc., Pittsburgh, Pa.; American Lung Assoc.; American Petroleum Inst., Washington, D. C.; and North Carolina Univ., Chapel Hill, School of Public Health, Proc. Natl. Conf. Clean Air Act, Chapel Hill, N. C., 1973, p. 79-100. 50 refs. (Oct. 31-Nov. 2.)*

The Clean Air Act uses four different phases to express the requirement that public comment should be made on certain actions. One formula instructs the Administrator to afford interested persons an opportunity to submit written comment. Another mandates the Administrator to consult with specified persons or groups of prior to taking some particular action. The most common instruction requires a public hearing. The meanings of the various verbal formulas, judicial response to challenges to the law, and the relationship between the courts and the Administrator are discussed.

46244 **APTIC NO. 68617**

Rocco, Vincent A.

A PROCEDURE FOR ESTIMATING THE ENVIRONMENTAL CAPACITY OF HIGHWAY PROJECTS IN THE AIR QUALITY PLANNING PROCESS. *Preprint, Ryckman, Edgerley, Tomlinson and Associates, Inc., St. Louis, Mo., 20p., 1973 (?). 9 refs.*

Highway planning agencies are now required to assess in detail the impacts of proposed facility improvements and newly located roads on corridor ambient air quality. Experience on numerous projects throughout the nation has shown that such assessments generally require lengthy, comprehensive evaluations of corridor meteorology, pre-construction ambient air quality, post- construction traffic growth and redistribution effects, gross emission generation, and pollutant dispersion characteristics. The definition of the several elements required for a comprehensive highway air quality impact assessment must be undertaken at the earliest project planning stage so that all necessary studies and field surveys can be initiated in parallel with other aspects of the location study or environmental impact evaluation. A novel procedure is described by which the transportation planner can determine whether detailed air quality studies are warranted for a proposed route alternate under consideration. The environmental capacity of critical average daily traffic (ADT) of a given roadway is defined as a function of readily available highway planning parameters. A series of capacity curves and planning criteria are presented which describe maximum average daily traffic volumes which can be tolerated under generalized most adverse meteorological conditions before the national ambient air quality standards for carbon monoxide and hydrocarbons will be exceeded at a given distance from the edge of the roadway. Use of this methodology affords a direct, valid means for structuring highway air quality studies and for direct assessment of air quality impact of proposed highways in suburban and rural environments. (Author abstract)

46245 **APTIC NO. 68600**

Selig, Edward I.

FEDERAL EXCISE TAXES ON LEAD IN GASOLINE AND ON AUTOMOBILES EMITTING POLLUTANTS. *In: Effluent Charges on Air and Water Pollution: A Conference Report. Oct. 15 and 16, 1971, Washington, D. C. Summary of Proceedings with Reporter s Notes. p. 75-86, 1973. 6 refs.*

A proposal is outlined for levying a tax of $4.25/lb of total lead in additives to gasoline sold in the U. S. to encourage production and marketing of the more expensive unleaded gasoline at prices competitive with leaded gasoline of like octane rating. To cushion the blow to independent refiners whose product depends heavily upon lead, a vanishing rebate scheme would permit application of the tax in annual stages to 1975, by which time its coverage would be comprehensive. In the first year, the tax would yield $1.1 billion, declining thereafter. This tax would eliminate lead emissions and ensure that the automobile industry would have sufficient fuel supplies required by the catalytic reactor. Opposition for this proposal is caused because the tax would increase gasoline prices for owners of older cars which must use leaded gas, because independent refiners could not convert to low-lead production in time at economical costs, and because the thermal reactor may be superior to the catalytic reactor and it could use leaded gas. The various aspects of this proposal are discussed. Another proposal is described to charge variable amounts for each vehicle sold depending on the emissions of the four major pollutants. The charges would be proportional to mileage driven and would equal the social costs of the automobile use. Advantages and disadvantages of this proposal are discussed, as well as alternatives such as smog taxes.

46246 **APTIC NO. 68887**

Swidler, Joseph C.

POLICY ASPECTS OF THE CLEAN AIR PROGRAM. *Triangle Universities Consortium on Air Pollution; Air Pollution Control Assoc., Pittsburgh, Pa., American Lung Assoc.; American Petroleum Inst. Washington, D. C.; and North Carolina Univ., Chapel Hill, School of Public Health, Proc. Natl. Conf. Clean Air Act, Chapel Hill, N. C., 1973, p. 187-198. (Oct. 31-Nov. 2.)*

The impacts of clean air legislation include a shift from coal and high sulfur oils to the clean fuels such as natural gas. Unfortunately, the impact of the air quality program coincided with the energy crisis. Many proposals to solve the fuel crisis are unrealistic. The reasons for the fuel crisis, the impact of air quality controls on the fuel situation, and the development of an energy policy are discussed. The changes in the Clean Air Act which may be needed because of the energy crisis are discussed.

46247 **APTIC NO. 68881**

Walker, Matthew S.

PROBLEMS OF ENFORCEMENT UNDER THE CLEAN AIR ACT. *Triangle Universities Consortium on Air Pollution; Air Pollution Control Assoc., Pittsburgh, Pa.; American Lung Assoc.; American Petroleum Inst., Washington, D. C.; and North Carolina Univ., Chapel Hill, School of Public Health, Proc. Natl. Conf. Clean Air Act, Chapel Hill, N. C., 1973, p. 68-78. (Oct. 31-Nov. 2.)*

The Clean Air Act, its purposes, and its policies are described. The enforcement procedures in the Act and the legal and administrative actions that may be taken are discussed. Some of the enforcement practices that are used and the responses to such practices from industrial operations and from State and local air pollution control officials are discussed. (Author abstract)

46248 **APTIC NO. 68880**

Young, Robert H.

AIR QUALITY REGULATION AND AGENCY DISCRETION. *Triangle Universities Consortium on Air Pollution; Air Pollution Control Assoc., Pittsburgh, Pa.; American Lung Assoc.; American Petroleum Inst., Washington, D. C.; and North Carolina Univ., Chapel Hill, School of Public Health, Proc. Natl. Conf. Clean Air Act, Chapel Hill, N. C., 1973, p. 51-67. 32 refs. (Oct. 31-Nov. 2.)*

The degree to which the Air Quality Act of 1967 and the Clean Air Amendments of 1970 contain an adequate statement of legislative policies and standards to guide the agency, those regulated by it, the courts, and the public in reviewing the activities of the Environmental Protection Agency and the reasonableness of the discretion exercised by the EPA are discussed. The problems of the Act and Amendments are discussed. The standards contained in the legislation are considered to be inadequate. (Author abstract modified)

46249 **APTIC NO. 63101**

Environmental Protection Agency, Research Triangle Park, N. C., Office of Air Quality Planning and Standards and Office of Enforcement and General Counsel

STATE AIR POLLUTION IMPLEMENTATION PLAN PROGRESS REPORT, JUNE 30 TO DECEMBER 31, 1973. *Rept. EPA-450/2-74-004, 115p., April 1974. 35 refs.*

NTIS: PB 232197/AS

A progress report for the period June 30 to December 31, 1973 is presented for statement implementation plan activities. Topics covered include: national issues, state implementation plan progress, the plan revision management system, enforcement of state implementation plans, air quality monitoring and data reporting, and state and local resources. Environmental Protection Agency approval has been granted to 16 state plans, discounting disapprovals with respect to maintenance of national standards. The remaining plans have only regulatory deficiencies in 26 cases; 13 plans are being finalized. Efforts are needed to improve the distribution and quantity of monitors and to assure timely data reporting.

46250 **APTIC NO. 68767**

Council on the Environment of New York City, New York

A CITIZEN S POLICY GUIDE TO ENVIRONMENTAL PRIORITIES FOR NEW YORK CITY 1974-1984 (INTERIM REPORT). *66p., Dec. 1973.*

Several aspects of environemntal pollution and environmental priorities for New York City were studied, and recommendations were made for environmental policy. The most effective measures to reduce the severity of the current fuel supply crisis and its environmental impact are those which would quickly lessen energy consumption. Even if efforts to lower consumption are successful, more polluting fuel will probably be needed for the city. Automobile use must be sharply curtailed and mass transit systems upgraded. Proposals are presented to reduce transportation pollution for automobiles, subways, buses, trucks, and trains. The City should declare that its waste disposal policy is to conserve resources, promote resource recovery, and enhance environmental quality. Therefore, the City should examine, set, and implement priorities for managing the flow of materials through the region to reduce wastes. The pollution and noise situation in the City are reviewed, and preventative measures are proposed. A system for improving environmental education in the city is proposed. The City should improve the climate of enforcement of pollution laws and improve the attitude toward dealing with these problems. Land planning must be used to determine environmental policies.

46251 **APTIC NO. 68923**

Council on Environmental Quality, Washington, D. C.

THE FEDERAL ENVIRONMENTAL MONITORING DIRECTORY. *116p., 1973. 189 refs.*

GPO

A compilation of agencies and publications (mostly federal) which provide national environmental monitoring data is provided for use by government officials, business people, and private citizens. The monitoring directory contains almost 200 sources of information and is divided into the following six sections: underlying factors (population, economic development, and urbanization); resources (water, timber, energy, minerals, and land); ecological factors (climate, natural disasters, and wildlife); pollution (air, water, radionuclides, pesticides, noise, and toxic substances); manmade environment (housing, transportation, aesthetic values, occupational environment, recreation, and cultural resources); and general sources (sources that overlap categorical boundaries). Air pollution monitoring activities and information sources listed include: the National Emissions Data System, the National Air Surveillance Network, the Federal Power Commission, the Department of Agriculture, the National Oceanic and Atmospheric Administration, the Environmental Protection Agency s Office of Research and Monitoring, and the Department of Health, Education, and Welfare s National Center for Health Statistics.

1972

46252 **APTIC NO. 68903**

Chass, Robert L.

AIR POLLUTION CONTROL: THE CASE OF LOS ANGELES COUNTY. *Calif. Manage. Rev., 14(3):92-103, Spring 1972.*

The air pollution problems in Los Angeles County are divided into two parts: photochemical smog and general air pollution. To evaluate these problems and to appraise the progress of their solution, the Los Angeles Air Pollution Control District maintains an inventory of emissions from all sources based on extensive sampling and analyses of emissions and on the development of emission factors. The Air Pollution Control District s control program prevents more than 10,500 tons of contaminants from entering the Los Angeles County atmosphere each day. The District s Rules and Regulations consist of approximately 100 rules incorporated in seven regulations. The heart of the control program is a permit system which requires permits for construction and operation of anything which might cause pollution. Enforcement is maintained by a series of inspections and hearings. The District also monitors the air and issues warnings to protect public health. The automobile is the cause of the photochemical smog problem in Los Angeles. Therefore emission standards for hydrocarbons, nitrogen oxides, and carbon monoxide are strict. Inspections and controls for new and old cars are discussed. Another approach to improving vehicle emissions is the regulation of the composition of fuel, especially the lead concentration. The control of emissions from power plants is also important in reducing pollution in the Log Angeles area.

46253 **APTIC NO. 68732**

Isard, Walter and Panagis Liossatos

SOME SIMPLE AIR POLLUTION AND URBAN-REGIONAL GROWTH MODELS. *Reg. Sci. Assoc., Pap., vol. 29:1-24, 1972. 3 refs. (Presented at the Regional Science Association European Congress, 11th, Rome, Italy, 1971.)*

A framework based on intertemporal growth models for examination of air pollution problems is developed, and basic concepts of evolution-type growth models are presented. The following types of models are examined: a simple Ramsey-type model with one polluting good and one abatement good; a simple model of two consumption goods (one polluting and one non-polluting) plus an abatement good; and models involving capital replacement, increasing labor productivity, and time discounting of utility. Such growth models can supplement traditional input-output, linear programming, and other models which are basically of a comparative statics variety. References are cited for the implications of diverse air pollution growth models on the location of facilities (polluting and non-polluting) and on agglomerative forces and location force fields, inclusive of feedback effects.

46254 **APTIC NO. 68765**

Jones, Charles O.

THE LIMITS OF PUBLIC SUPPORT: AIR POLLUTION AGENCY DEVELOPMENT. *Pub. Admin. Rev., 32(5):502-508, Sept. - Oct. 1972. 20 refs.*

The development of a Federal air pollution agency is reviewed, with particular emphasis on the impact of public support. The original National Air Pollution Control Administration had little public support initially, notwithstanding the inadequate expertise and lack of adequate funding. Reduction of air and water pollution was mentioned by 17% of respondents on a poll of national problems taken in 1965. In 1969-1970, however, massive public support for pollution control emerged, and in 1970 pollution was mentioned by 53% of the respondents in a similar poll. The present Environmental Protection Agency now faces the task of building support less diffuse in nature, i.e., support from constituent regulatory agencies at the state and local level and specific to the agency s continuing programs. An outline is given of the development of an air pollution agency in the Department of Health, Education, and Welfare during the period of 1955-1970 along with major environmental legislation affecting air pollution for the period 1969-1970.

46255 **APTIC NO. 68328**

UNESCO S NATURAL RESOURCES RESEARCH PROGRAMME: 1973-74. *Nat. Resour., 8(4):2-10, Oct.-Dec. 1972.*

The program and budget of Unesco for 1973-1974 were discussed and approved during the 17th session of the General Conference of the Organization in Paris from Oct. 17 to Nov. 21, 1972. The structure of the Department of Environmental Sciences and Natural Resources Research remains the same and comprises three divisions (Natural Resources Research, Hydrology, and Oceanography). The Division of Natural Resources Research will take the name of Division of Ecology and Earth Sciences and will deal with Man and the Biosphere Program, integrated natural resources research and ecology, earth sciences and natural hazards, and the International Geological Correlation Program. The budget for 1973-1974 amounts to $870,000, not including staff costs or funds administered under the United Nations Development Program. The text of the relevant program resolutions adopted by the General Conference and some of the outstanding features of the activities envisaged for the implementation of these resolutions are presented and discussed. (Author introduction modified)

1971

46256 **APTIC NO. 68354**

Jones, Charles O.

DOING BEFORE KNOWING: CONCEPT DEVELOPMENT IN POLITICAL RESEARCH. *Preprint, Pittsburgh Univ., Pa., p. 215-228, 1971 (?). 13 refs.*

The problems of concept development, utilization, and modification in political research are discussed. Though lacking a paradigm, political scientists still must develop concepts as guides to data collection--essentially an exercise in doing before knowing. Three cases of concept development are introduced: concepts for general understanding, concepts for research design, and classification of empirical findings. Each of these cases is illustrated, and special emphasis is given on conceptual development and modification for analysis of air pollution policy action. (Author abstract modified)

46257 **APTIC NO. 68736**

Koshi, Masaki

THE SYSTEM OF AREA TRAFFIC CONTROL IN CENTRAL TOKYO. *Wheel Ext., 1(1):21-30, Spring 1971.*

A system of traffic control in Tokyo is described which encompasses 123 intersections and 196 detectors at present. Future plans call for expanding the system into a medium-sized network of approximately 360 intersections and 1000 traffic detectors. The control methods consist of a series of modes to control traffic. Since it is not practical to attempt applying a uniform cycle time, split pattern, offset pattern, or control model to an entire control area, the area was divided into subareas. The effects of control on traffic volume, travel time, traffic accidents, traffic jams, traffic noise, and air pollution from automobile exhausts will be evaluated. Instead of using air pollution data to measure effects on pollution, the degree of change in the speed and phase of engine operation (frequency and duration of full stops at signals and crossings, acceleration, and deceleration) that occurs once the control system begins operation will be used to estimate the quantitative and qualitative changes in engine exhaust.

46258 **APTIC NO. 63068**

United Nations, Dept. of Economic and Social Affairs

THE IMPACT OF MOTOR VEHICLES ON AIR, NOISE AND SAFETY: PROBLEMS AND POLICIES. *Preprint, 49p., June 1971. 46 refs. (Presented at the United Nations Conference on Human Environment, 1971.) (Available from Univ. Microfilms, Inc., Ann Arbor, Mich., Order no. WO 62039 2.23.)*

The emission of pollutants from motor vehicles is the result of outdated planning in urban development and land use, inadequate road and vehicle designs, and unsatisfactory traffic conditions and regulatory devices. To deal with such problems, both technical and regulatory measures are necessary. Rational planning of urban transport systems, improved design and construction of roadways, new types of vehicles and engines, extension and use of public transit systems, direct control of traffic movement, restrictions of vehicle conditions, and improved international regulations and standards, can be used to reduce emissions. Noise pollution from passenger cars, sports cars, motorcycles, and trucks are also reviewed, and methods of reducing noise through planning, alternative transportation facilities, roadway design, traffic flow, and noise and traffic restrictions are discussed. (Author abstract modified)

SOCIAL ASPECTS

1974

46259 **APTIC NO. 69007**

Katsuya, Atsuo

AN APPRAISAL METHOD FOR MEASURING THE QUALITY OF URBAN LIVING ENVIRONMENT. *(Kankyo osen kara mita seikatsu kankyo no sogo hyoka ni kansuru kenkyu). Text in Japanese. Duboku Gakkai Ronbun Shu (Trans. Japan Soc. Civil Eng.), no. 229:67-76, 1974. 16 refs.*

Inhabitants of Osaka answered a questionnaire in 1971 which investigated how much inhabitants living in urban areas are aware of their environment. The expansion of Valimax analysis facilitated a comparison between analysis of items answered by inhabitants of different cities. The consciousness of Osaka inhabitants of their environment is strongly influenced by environmental pollution--in particular, by air pollution (caused by factories) noise, traffic situations, and dirty rivers in this order.

46260 **APTIC NO. 68522**

Kono, Yasuko, Mitsuyo Tsuda, and Fumikazu Toyoda

FARMERS AWARENESS OF HEALTH IN POLLUTED ENVIRONMENT. *(Kankyo osen chiku nomin no kenko ishiki ni tsuite). Text in Japanese. Preprint, Japan Assoc. for Rural Medical Care, 23(3):284-285, 1974. (Presented at tje Japan Association for Rural Medical Care, General Conference, 23rd, Shizuoka, Japan, Oct. 1974.)*

In recent years, trees around a ceramic tile factory in a small village in Toyama Prefecture began to die; since the tree damage was concentrated around the factory, the local residents began to question and blame the factory management, and this became a political issue. First, sulfur oxides were suspected, but the measurements were low enough so that the trees would not have been affected. After further search, it was found that fluorine in the glaze had polluted the air of an area of 250 m radius around the factory, and the concentration was as high as 100 ppm in the entire area. This developed into a law suit against the factory management. But when health examinations were given to the village residents, of the total 439 residents of the polluted area, 115 did not receive an examination. This was 26.2% of the total population; to compare their health consciousness with others, 420 residents of control area were invited for examination and 38.6% did not comply. The reasons given were: 24.5% of men and 32.5% of women answered they fel t perfectly healthy, 21.8 of men and 9.1% of women answered that they received examinations elsewhere. This data shows the level of awareness of the resident concerning their health and air pollution. Although there were no symptoms of damage among the people who received a health examination, physicians wished that more people would show more concern about their own health.

46261 **APTIC NO. 69015**

Sekiguchi, Takashi

A STUDY OF PERCEPTION OF AIR POLLUTION. *(Taiki osen no pasepushion no kenkyu). Text in Japanese. Kisho Kenkyu Noto (Meteorol. Study Note), no. 119:257-271, 1974. 82 refs.*

In order to know how society evaluates and comprehends air pollution the average attitude of inhabitants in a community and their methods of coping with air pollution should be considered as sources of information. These factors might be termed the social value of air pollution. A method of investigating air pollution perception is presented. The definition of perception is not always clear-cut. It means, however, how people are aware of air pollution, what kind of countermeasures are taken against air pollution, and how people cope with the situation caused by air pollution. The Clean Air Act was approved in the British cabinet in 1956. The chief purpose was the prevention of smoke from domestic heating. The expenses for the reconstruction of domestic heating facilities were subsidized in order to encourage the reconstruction of domestic facilities. They consisted of 40% from the central government, 30% from local governments, and 30% from individual funds. In replacement of the conventional coals fuels for domestic heatings were switched over to cokes, anthracite, gas, and electric power. Local governments which adopted this system are called Smoke Control Areas. Their number increased rapidly in and after 1956 but has remained stagnant since 1965.

imported sulfate aerosols arising from increasing emissions of sulfur oxides from distant power plants that burn high-sulfur fuels are now intruding into northeastern urban areas. Massive conversion of urban power plants to high-sulfur fuels or unrestricted use of tall stacks and supplementary control systems can greatly aggravate the acid sulfate aerosol problem. Flue gas desulfurization, cleaner fuels, or modified combustion processes will be required to control the acid aerosol sulfate problem. Expected growth in coal-fired steam electric power generation must be accompanied by increased availability of cleaner fuels or widespread use of effluent controls to avoid further aggravation of the acid sulfate aerosol problem. Equipping the majority of light duty motor vehicles with oxidation catalysts would measurably increase human exposure to acid sulfate aerosols. Control of these mobile source emissions may prove mandatory if public health is to be protected. (Author abstract modified)

46267 **APTIC NO. 69832**

Hoell, Wolfgang and Ruediger Hampp

CERTAIN ASPECTS OF LEAD IN THE BIOSPHERE. *(Blei in der Biosphaere, einige Aspekte). Text in German. Naturw. Rundschau, 27(7):272-276, July 1974. 25 refs.*

Studies on the origin, distribution, and health effects of lead in the atmosphere are reviewed. Most of the lead present in the atmosphere originates from leaded gasoline, while the contribution by natural sources of lead and lead smelters is almost negligible. As emitted in the exhaust gases, most of the lead is in the form of its halogenides, 10 to 20% of which is in gaseous form, while the rest is aerosol in a size range of 0.5-2 micron. Once emitted, lead is present in the atmosphere for up to 30 days. Washout of the lead, especially by slow rain, and conversion of the halogenides into lead carbonate and oxides after a residence time of 18 hr in the atmosphere were observed. The distribution of lead in the year rings of trees can not be used as an indicator of the variations in the atmospheric lead concentration as relocation and migration were evidenced, while positive correlation between the lead content in leaves and the traffic density was established. The resorption of lead from the intestines was found to amount to 2.-6.8% of the lead resorbed from the lungs. Anemia, asthenia, loss of weight, chronic renal lesion, and neurological changes due to lead were observed. Once retained in the bones, lead may be mobilized by changes in the calcium turnover. Lead interferes with the hemosynthesis. Lead acetate causes chromosomal aberrations in test animals.

46268 **APTIC NO. 68435**

Kuwata, K.

PHOTOCHEMICAL SMOG IN LOS ANGELES. *(Eosuanzerusu no kokagaku sumoggu). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 3(9):683-692, Sept. 1974.*

A general description is given of the famous 1940 photochemical smog in Los Angeles, characterized by plant damage such as silvering of the lower surface of cereal and tobacco leaves and by eye-irritation, quite different from the previously recognized smog due to sulfur dioxide. The study of the origin and cause of Los Angeles smog is described. Smog formation is caused by the reaction of of olefins and alkylbenzenes with nitrogen dioxide and oxygen in solar radiation, forming photochemical oxidants consisting mainly of ozone, NO2 and peroxyacyl nitrates. Exposure chamber experiments, actual human damages (especially eye irritation), and the actual air quality measurements for oxidants in the city are described.

46269 **APTIC NO. 69853**

Maziarka, Stefan

SCIENTIFIC ACHIEVEMENTS IN COMMUNAL HYGIENE FOR THE 30TH ANNIVERSARY OF THE PEOPLE S REPUBLIC OF POLAND. *(Dorobek naukowy w dziedzinie higieny komunalnej w okresie XXX-lecia Polskiej Rzeczypospolitej Ludowej). Text in Polish. Roczinki Panstwowego Zakladu Higi, 25(4):419-426, 1974.*

Polish achievements in communal hygiene in the first 30 postwar years are presented. Research institutes were reorganized, financed, and founded. The studies conducted concerned; the methodology of conducting sanitation hygienical studies; air pollution levels and their effect on human health; legislation preveinting air pollution; anti-pollution campaigns in Poland; and working out of solutions of air pollution problems. The studies indicated that air pollution in Silesia had reached hazardous levels. The State Hygiene Institute of Warsaw studied the air pollution level in the capital. Complex studies of the carcinogenic effect of atmospheric air pollution were conducted. High concentrations of carcinogenic hydrocarbons were found in the Silesian air. There was a close link between the pollution levels and the mortality rate among lung cancer patients from the cities under study, especially in Cracow. The biologic toxicological compounds of atmospheric air pollutants were studied. These studies constituted a scientific basis for establishing the highest permissible concentrations of pollutants in the atmospheric air. The studies also proved that tests with nuclear weapons did not affect the population in the given areas, due to the preventive safety measures taken. Studies were also conducted concerning the quality of residential buildings constructed in rural areas and in cities.

46270 **APTIC NO. 68413**

Ryabchikov, A. M.

ENVIRONMENTAL CHANGES AS A RESULT OF INDUSTRIAL ACTIVITY. *Meteorol. i Gidrol., no. 3:9-16, 1974. Translated from Russian. Joint Publications Research Service, Arlington, Va., p. 8-17, May 22, 1974.*

NTIS: JPRS 62052

The global and regional changes of the environment under the influence of industrial activity are described. The problem of paying a negative cost of production, that is of maintaining natural equilibrium in the biosphere by restoring and protecting the environment, is discussed. Six energy factors determine the dynamic equilibrium of the environment: solar radiation, gravity, tectonic forces, chemical energy, biogenic energy, and the energy of global industry. Industrial energy from human activity is a new factor which may affect the other energy factors. Air pollutants may affect the heat balance of the atmosphere. The chemical equilibrium in the environment may be disrupted by various technological processes such as iron processing, mining, and petroleum recovery and refining which emit many pollutants into the environment. Industrial cities discharge industrial and domestic wastes as solid and air pollution. Modern pollution control methods, including biological means such as the planting of vegetation, make it possible to remove 70-80% of certain harmful pollutants under laboratory conditions. In reality, not more than 25% of the pollutants are trapped.

46271 **APTIC NO. 68783**

Syrota, J. and G. Lamouroux

ENVIRONMENTAL PROBLEMS IN JAPAN. *(Les problemes de l environnement au Japon). Text in French. Rev. Ass. Fr. Tech. Petrole, no. 223:17-20, Jan.-Feb. 1974.*

Problems of environmental protection and clean air maintenance as tackled in Japan are described. Air pollution is monitored by dense national and regional monitoring networks. The stations of the former are equipped with instruments for the measurement of the oxides of sulfur, nitrogen and carbon, oxidants, hydrocarbons, cadmium, lead, zinc, as well as with apparatuses for the recording of the principal meteorological parameters. The air quality of large cities, such as of Osaka and Tokyo, is monitored by special monitoring and alarm networks. While the sulfur dioxide concentrations are relatively low with an annual average of 0.03-0.045 ppm in Tokyo, oxidants have triggered several alarms during the summer periods of the past years. The maximum allowable SO2 concentration has been reduced to 0.2 ppm, a level that may be exceeded in 1% of the hours of the year. The SO2 emissions are effectively abated by the construction of high stacks, by increased im-ports of low-sulfur petroleum, by extensive fuel oil desulfurization, and by full-scale flue gas desulfurization. A total of 35 flue gas desulfurization units are currently in operation, mostly in large-capacity power plants.

46272 APTIC NO. 69189

National Swedish Environment Protection Board, Stockholm (Sweden)

ENVIRONMENTAL RESEARCH 1971/72. *Publication 1974:3E, p. 5-79, 1974. 95 refs.*

Research activities supported by grants from the Research Committee of the National Swedish Environment Protection Board mainly in the fiscal year 1971/72 are outlined. Topics covered include: the turnover of mercury in animal organisms; analysis of mercury in human blood and in woodland mosses; the effects of mercury on human chromosomes; the effect of methylmercury hydroxide on detoxification mechanisms in animals; mercury turnover in air, water, and soil; the analysis of chlorinated hydrocarbons, including pesticides; analytical methods for cadmium, lead, calcium, indium, and arsenic; the effects of air pollution on the photosynthesis of lichens; the effects of herbicides on berry bushes; the effects of heavy metals on humification processes; the effects of particulate air pollution on tracheobronchial clearance in humans; the thermal and photochemical decomposition of flame retardants; genetic effects of pesticides; the effects of sublethal zinc concentrations on fish; occupational exposure to cadmium; epidemiological cadmium investigations; subcellular metabolism of polychlorinated biphenyls; the toxicity of PCB to mammals; the teratogenic effects of phenoxy acids on the quail; the toxicological effects of pentachlorophenol in laboratory animals; the photochemical decomposition of aromatic halogenated compounds; investigations of odors; measurement of airborne sulfur particulates; a station network for air and precipitation chemistry; the mapping of mercury in air and precipitation; chlorinated hydrocarbons in airborne fallout; dissemination of microbial aerosols from sewage treatment plants; ambient air concentrations of photochemical oxidants; mass balances and deposition of refuse incineration; the investigation of odors from vehicle exhaust gases; the deposition of sulfate and acid with precipitation; and changes in the chemical composition of soils caused by atmospheric acidity.

1973

46273 APTIC NO. 68789

Winthrop, S. O.

AIR POLLUTION IN THE URBAN ENVIRONMENT. *Environmental Protection Service, Ottawa (Canada), Air Pollution Control Directorate, Rept. EPS 3-AP-73-6, 27p., Aug. 1973.*

Urban air pollution in Canada is reviewed in terms of emission sources, air pollution health effects, present pollution control methods, and economic implications. Transportation accounts for 56.9% of the air pollution; while industrial processes, fuel combustion in stationary sources, solid waste disposal, and miscellaneous sources account for 24.5, 8.3, 2.7, and 7.5%, respectively. Carbon monoxide, the most abundant air pollutant originates primarily from motor vehicle exhaust; while nitrogen oxides arise principally from combustion processes, the most important single source also being motor vehicles. Sulfur dioxide arises mainly from industrial operations and electrical power generation, while particulates are due to several different sources. Sulfur dioxide is capable of irritating the upper respiratory tract, and sulfuric acid resulting from sulfur trioxide conversion is capable of producing lung damage. Particulates, aside from exerting deleterious effects in their own right, can accentuate the adverse physiological effects of simultaneously inhaled gases. Carbon monoxide produces its primary biological effect through inactivation of hemoglobin. Present control methods for such pollutants include: electrostatic precipitators, settling chambers, cyclones, filters, scrubbers, desulfurization of fuels, and process modifications. An estimated $1.5 billion annual loss is attributed to air pollution in Canada.

1971

46274 APTIC NO. 68553

Veeraraghavachary, K.

NEW TRENDS IN DESIGN OF CHIMNEYS. *Indian J. Power River Val. Dev., 21(5):163-166, May 1971.*

Chimney design has become complicated because of ever increasing parameters of boilers with larger discharge of flue gases requiring dispersion of the ash and sulfur dioxide so that they do not pollute the atmosphere beyond statutory limits. This necessitates taller chimneys, which in turn pose new structural, operational, and maintenance problems. The design of chimneys not only involves the structural design of the shell and its foundation, but also the selection of height and the exit velocity of flue gas so pollution is controlled. A review is given of stack design factors affecting air pollution. The interrelationship among the concentration of air pollution, the chimney height, the quantity of flue gas, and the atmospheric conditions (temperature difference between flue gas and ambient air and factors affecting vertical and horizontal dispersion) can be expressed by an equation which can be used to calculate the height of the chimney necessary to give a certain pollution concentration in the area. An example is given to calculate necessary stack heights for ash and SO2 dispersion. The use of multiflues to replace extremely high chimneys is described.

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